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PHYSICS ABSTRACTS

BEING

SCIENCE ABSTRACTS—SECTION A

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ABSTRACTS 963-118

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The language of an original article is indicated after the decimal number, unless the article is in English, thus: = 3 German, = 4 French, = 5 Italian, = 6 Spanish, = 82 Russian, = 956 Japanese.

MATHEMATICS

963 513.581.3

A remark on a property of a special pencil of quadrics. PEDOE, D. *Proc. Camb. Phil. Soc.*, 38, *pp.* 234–235, *April*, 1942.

964 513.675

Note on the degeneration of algebraic varieties. HODGE, W. V. D. *Proc. Camb. Phil. Soc.*, 38, *pp.* 231–233, *April*, 1942.

965 513.723.6

A note on *k*-connexes. HODGE, W. V. D. *Proc. Camb. Phil. Soc.*, 38, *pp.* 129–143, *April*, 1942.

966 517.3 : 539.133

Two-centre integrals occurring in the theory of molecular structure. COULSON, C. A. *Proc. Camb. Phil. Soc.*, 38, *pp.* 210–223, *April*, 1942.—A table of integrals occurring in studies of molecular structure in connection with energy levels, Stark effect, van der Waals forces, intra-nuclear arrangements, etc., involving 2 or more centres of force.

967 517.521.8

Some relations between certain methods of summation of infinite series. GOOD, I. J. *Proc. Camb. Phil. Soc.*, 38, *pp.* 144–165, *April*, 1942.

968 517.521.8

On Hausdorff's methods of summability. ROGOSINSKI, W. W. *Proc. Camb. Phil. Soc.*, 38, *pp.* 166–192, *April*, 1942.

969 517.65

The Fermi–Dirac functions. AULUCK, F. C. *Phil. Mag.*, 33, *pp.* 159–160, *Feb.*, 1942.—An evaluation of the integral $\int_0^\infty \frac{\phi'(x)dx}{e^{x-t}+1}$.

970 517.65 : 551.521.3

Approximate formulae for functions expressed as definite integrals. MIAN, A. M., AND CHAPMAN, S. *Phil. Mag.*, 33, *pp.* 115–130, *Feb.*, 1942.—In the theory of absorption of radiation in an exponential atmosphere it is necessary to consider the integrals

$$E_n(t) = \int_1^\infty e^{-tx}x^{-n}dx, B_n(t) = \frac{2}{\pi}\int_0^{\frac{1}{2}\pi} e^{-t\sec\varphi}\cos^n\phi d\phi.$$

The available series-expressions for these integrals are inconvenient for moderate (integer) values of n, and for values of t that are neither small nor large. Approx. expressions $E'_n(t)$ and $B'_n(t)$ are given in the form $E'_n(t) = \sum(e_m/\varepsilon_m^{n-2})e^{-\varepsilon_m t}$, $B'_n(t) = \sum(b_m/\beta_m^n)e^{-\beta_m t}$

971 517.942.82 : 621.316.7 = 3

Method of solving the Laplace transformation for transient phenomena in linear networks, applied to automatic regulation. GRÜNWALD, E. *Arch. f. Elektrotechn.*, 35, *pp.* 379–400, *Aug.* 25, 1941.—[Abstr. 536 B (1942)].

972 518.41

Method of finding the equations of curves. TOBIN, T. C. *Engineering*, 153, *p.* 15, *Jan.* 2, 1942.—Correspondence. [Abstr. 2479 (1941)].

973 518.5

An all-electric integrator for solving differential equations. VARNEY, R. N. *Rev. Sci. Instrum.*, 13, *pp.* 10–16, *Jan.*, 1942.—Four basic devices are required for an integrator of differential equations: (1) integrating units, (2) coupling devices for interlocking integrators and multipliers, (3) multiplier units, (4) generators of functional coefficients. These devices and their applications to various types of problems are given. Results of an entirely completed machine are not available, but preliminary results show the device to be good to $\frac{1}{2}\%$ and potentially in some cases to nearly $0{\cdot}1\%$. The electric coupling renders the machine free from mechanical difficulties and reduces the cost.

974 518.5 : 621.317.757

Calculating machines. CREW, E. W. *Students' Quart. J. Instn Electr. Engrs*, 12, *pp.* 16–22, *Sept.*, 1941. *Engineer, Lond.*, 172, *pp.* 438–441, *Dec.* 19, 1941.—Principles of counting, digit-adding and carrying mechanisms are given and illustrated; descriptions of typical machines, both mechanical and electrical, follow in brief, and a short section on the harmonic analyser and its uses completes the survey.

G. F. F.

975 519.241

Zipf's "law of urban concentration." CARROLL, J. B. *Science*, 94, *p.* 609, *Dec.* 26, 1941.

976 519.27

Further investigations in factor estimation. LAWLEY, D. N. *Proc. Roy. Soc. Edinb. A*, 61, 2, *pp.* 176–185, 1942.—A method of factor estimation is given in which assumptions are made only about the form of the error distributions of the tests administered. This is compared with a method previously suggested in which, on the contrary, the test scores and the individual factor measurements were assumed to be normally distributed over the population of individuals tested. A comparison is also made with other processes at present in use.

977 519.271.01

Probability applications. EVANS, U. R. *Engineer, Lond.*, 173, *p.* 143, *Feb.* 13, 1942.

978 519.272

The variances of the means and the variance of the slope of the line of relation of a linear, composite, bivariate distribution. CHARNLEY, F. *Canad. J. Res. A*, 20, *pp.* 6–9, *Jan.*, 1942.—The variances of the means and the variance of the slope of the line of relation of a linear, composite, bivariate distribution, in which the variances and correlation coefficient of the component populations remain constant, are analogous to the corresponding variances of a linear regression line. The variances of the means are, respectively, σ_x^2/N, σ_y^2/N, and the variance of the slope of the line of relation is $S_{YL}^2/N(S_X^2 - \sigma_x^2)$ where σ_x^2, σ_y^2 are the variances of the component populations, S_{YL}^2 is the vertical variance of the composite distribution around the line of relation, N is the total number of measures, and S_X^2 is the variance of the composite distribution around the Y-axis.

979 519.272.12

The distribution of the ellipticity statistic L_e when the hypothesis is false. GIRSHICK, M. A. *Terr.*

Magn. Atmos. Elect., 46, *pp.* 455–457, *Dec.*, 1941.—[See Abstr. 2327 (1940)].

980 519.413

Confounded designs for asymmetrical factorial experiments. NAIR, K. R., AND RAO, C. R. *Sci. and Cult.*, 7, *pp.* 313–314, *Dec.*, 1941.

ASTRONOMY

981 521.153

The non-radial oscillations of polytropic stars. COWLING, T. G. *Mon. Not. Roy. Astr. Soc.*, 101, 8, *pp.* 367–375, 1941.—The non-radial oscillations of a polytropic gas sphere are discussed. Periods are obtained numerically in certain special cases by an approx. method, and the error of the approximation is estimated. An infinite number of indefinitely long periods is shown in general to exist. The possibility of resonance between long-period oscillations and the tidal force in double stars is considered, and it is concluded that such resonance will not in general greatly affect the tidal distortion. The bearing of the results on the resonance theory of the Moon is discussed.

982 521.153

On the vibrational stability of gaseous stars. LEDOUX, P. *Astrophys. J.*, 94, *pp.* 537–548, *Nov.*, 1941.—The dependence of the vibrational stability of stars upon their masses has been investigated, and it has been established that, for laws of generation of energy of the type of Bethe's law, the ordinary law of opacity and a ratio of the sp. ht. of matter $\gamma = \frac{5}{3}$, some instability would first appear for masses larger than $100M_{\odot}$. Changes in the law of opacity as well as in the ratio of the sp. ht. are more likely to occur in the outer layers of the stars, and their effects on the stability, especially for the giants, can be important. If the region where they occur is appropriately chosen, these changes could render the star unstable for one of the higher modes (first or second), although it remains stable for the preceding ones. Some attention was also paid to the stability of shell-source and ball-source models with the conclusion that they would not exhibit any special instability.

See Abstr. 991 521.153 : 523.82

See Abstr. 986 521.154 : 523.8

983 522.59 : 523.82

Stellar radiometric equipment of the Harvard College Observatory. STERNE, T. E., AND EMBERSON, R. M. *Astrophys. J.*, 94, *pp.* 412–426, *Nov.*, 1941.—The radiometric equipment consists of vacuum thermocouples at the Newtonian focus of the 61 in. Wyeth reflecting telescope, a moving-magnet galvanometer, automatic recording mechanism and certain auxiliary devices. An account is given of the theory of the design of the electrical circuit; instructions are provided for making the small thermocouples.

See Abstr. 984 523.2 : 523.5

984 523.5 : 523.2

Meteorites and the age of the solar system. ARROL, W. J., JACOBI, R. B., AND PANETH, F. A. *Nature, Lond.*, 149, *pp.* 235–238, *Feb.* 28, 1942.—Ages of 6 iron meteorites chosen for their widely differing He contents are determined from their He, U, and Th contents by an improved method, which is outlined. The ages deduced from He content vary from 60 to 7 600 million years, with a probable error of about 20%. The higher figure definitely excludes the age of 2 000 million years found by extrapolating the "expanding universe" data. Rough ages are also given for 50 iron meteorites from their He contents, assuming the constant U and Th contents found for the six fully analysed. None exceeds 6 800 million years. The validity of the age determinations is discussed with reference to the "surplus He" found in certain beryls. A. HU.

See Abstr. 1162 523.74 : 550.385

985 523.77

The grating infra-red solar spectrum. V. Atomic lines in the far infra-red. VI. The map from 14 μ to 7 μ. ADEL, A. *Astrophys. J.*, 94, *pp.* 449–467, *Nov.*, 1941.—[See Abstr. 2545 (1941)]. Six intense lines in the grating infra-red solar spectrum are tentatively correlated with the transitions 3D–4P of normal Na and 6P–5D of normal K. A high-resolution map of the infra-red solar spectrum is presented. It covers the region from 14 μ to 7 μ and exhibits an actual resolving power of $\sim$1 cm.$^{-1}$ throughout. About 400 absorption lines are contained in the map, including the rotation-vibration lines of the great atmospheric bands and numerous intense lines apparently of atomic origin. Tables of wavelengths and frequencies accompany the map.

986 523.8 : 521.154

Extended stellar atmospheres: a review of the problems of gaseous shells. STRUVE, O. *Astrophys. J.*, 95, *pp.* 134–151, *Jan.*, 1942.—The properties of the gaseous shells around early-type stars are discussed. The questions are: (1) Why do some stars have shells, others not? (2) Why do some shells expand, while others are stationary, both types occurring in different stars of similar class, or even in a single star? (3) Why do the shells vary irregularly? The data are classified, and it is shown that there are in an ideal case 3 observable layers: (1) a stationary, main-sequence reversing layer, (2) above it a stationary α-Cygni-type layer with or without dilution, and (3) on top an expanding P-Cygni-type layer of varying optical thickness. The origin of the 2 upper layers may in some cases be ascribed to rapid rotation of the reversing layer.

987 523.81

The photographic determination of stellar parallaxes with the 60 and 100 in. reflectors. MAANEN, A. VAN. *Astrophys. J.*, 94, *pp.* 396–398, *Nov.*, 1941.—Trigonometric parallaxes determined with the 60 and 100 in. reflectors are given for 25 fields, including 27 stars, 23 of which have photographic absolute magnitudes of + 10 or fainter; 3 are fainter than + 15.

988 523.82

Radiometric magnitudes of some of the brighter stars. EMBERSON, R. M. *Astrophys. J.*, 94, *pp.* 427–435, *Nov.*, 1941.—The equipment of the Harvard Coll. Obs. [Abstr. 983 (1942)] has been used to determine the brightness of 82 bright, non-variable stars, fairly well distributed over the northern hemisphere. Care was taken in the reductions to allow for the effects of atmospheric extinction and of the ageing of the silvered surface of the mirror. The resulting magnitudes agree in scale with the Mt. Wilson radiometric magnitudes, but there is a difference in zero point and a

systematic spectral effect. The correlation between colour index and photographic heat index is close. Within each spectral class from F to late K (possibly also M) the dwarf stars have smaller heat indices than the giants or super-giants.

989 523.82

Photometric observations of μ Sagittarii. HALL, J. S. *Astrophys. J.*, 94, *p.* 550, *Nov.*, 1941.

990 523.82

The temperature variation of δ Cephei. ROACH, F. E. *Astrophys. J.*, 94, *p.* 551, *Nov.*, 1941.

991 523.82 : 521.153

Stellar models with isothermal cores. HENRICH, L. R., AND CHANDRASEKHAR, S. *Astrophys. J.*, 94, *pp.* 525–536, *Nov.*, 1941.—Two types of configurations have been studied: (1) models with isothermal cores and polytropic envelopes ($n = 3$) and (2) models with isothermal cores and radiative point-source envelopes with a law of opacity $\kappa = \kappa_0 \rho T^{-3.5}$. The most important characteristic of these models is the existence of an upper limit to the fraction ν of the total mass which can be contained in the core. For models of type 2, $\nu_{max} \sim 35\%$. Also it appears that, as ν increases, the radius of the star first decreases to a min. and then increases. Further, the luminosity of the star is found to increase by about a factor 3 from the stage when it has no isothermal core to the stage when the core contains the max. possible mass.

See Abstr. 983 523.82 : 522.59

992 523.83

Investigations on proper motion. XXII. Faint members of the Pleiades cluster. MAANEN, A. VAN. *Astrophys. J.*, 94, *pp.* 399–406, *Nov.*, 1941.—Two pairs of plates with intervals of 15 and 19 years, respectively, taken at the Newtonian focus of the 100 in. reflector, have yielded proper motions which revealed in a region 40′ by 30′ around Alcyone more than 24 new members of the Pleiades group. The photographic magnitudes of the new members range from 12·4 to about 17·5. The observations indicate that the max. of the frequency curve of apparent magnitude has not been passed.

993 523.83

A statistical theory of stellar encounters. CHANDRASEKHAR, S. *Astrophys. J.*, 94, *pp.* 511–524, *Nov.*, 1941.—The principles of a statistical theory of stellar encounters are developed. The fundamental idea is to describe the fluctuating part of the gravitational field acting on a star in terms of 2 functions: a function, $W(F)$, which gives the probability of occurrence of a field strength F, and a function, $T(F)$, which gives the average time during which the field strength F acts. With regard to $W(F)$ it is shown that a probability-distribution function derived by Holtsmark to describe the inter-ionic fields in a discharge tube can be adapted to suit the gravitational case. In a certain approximation this probability of a given field is directly related to the probability of finding the nearest neighbour to a given star at some prescribed distance. In this latter approximation the mean life of the state F can be obtained by a formula in the theory of Brownian motion. In terms of these functions the probable accelerations which a star will undergo can be determined. The problem of the time of relaxation of a stellar system has been reconsidered.

994 523.841 : 523.874

A spectrographic study of the eclipsing variable star, WW Draconis. JOY, A. H. *Astrophys. J.*, 94, *pp.* 407–411, *Nov.*, 1941.—The radial velocities of the components of the eclipsing variable WW Draconis, ADS 10152 A, were measured from 31 spectrograms. The velocity curve of the primary star, type G2, is well determined. The secondary spectrum, type K0, is too faint for reliable measurement. With the aid of Plaut's photometric solution the dimensions and physical properties were deduced. Emission H and K lines of Ca are displaced in the same direction as the lines of the secondary star but have a smaller range. The mean velocity of the northern star of the visual pair, its spectral type and the spectroscopic absolute magnitude, were determined.

995 523.852

Analysis of the Milky Way in Auriga. KIEFER, L., AND BAKER, R. H. *Astrophys. J.*, 94, *pp.* 482–492, *Nov.*, 1941.—This analysis of the Milky Way to 2 000 parsecs in direction of Auriga is based upon counts of stars to the 15th magnitude and determination of colour excesses of stars in certain latitudes of the region. Obscuration is best represented by 2 clouds: a very patchy cloud at 300 parsecs, which produces most of the visible bright and dark areas of the region, and a more uniform cloud at 800 parsecs. The density gradients are negative in this direction. Comparisons with other data support the conclusions.

996 523.852

Analysis of a transverse section of the Milky Way in Aquila. BAKER, R. H. *Astrophys. J.*, 94, *pp.* 493–500, *Nov.*, 1941.—The analysis of this section, 60° long, across the Milky Way around long. 13°, is based on star counts to magnitude 15, colour excesses of stars determined at 3 centres, and published counts of extragalactic nebulae. The obscuration is ascribed to 2 clouds: one at 500 parsecs, which covers the entire section and is not far from uniform, aside from darker spots at 2 places; the second cloud at 2 000 parsecs, whose density increases fairly symmetrically from latitude 15° to the galactic equator. The density functions near the galactic plane decrease at first with distance from the Sun and then increase to values at 2 000–3 000 parsecs, comparable with that near the Sun. Some of the results are provisional.

997 523.852

On the clustering tendencies among the nebulae. II. A study of encounters between laboratory models of stellar systems by a new integration procedure. HOLMBERG, E. *Astrophys. J.*, 94, *pp.* 385–395, *Nov.*, 1941.—[Abstr. 2923 (1940)]. Deals with the problem of whether the loss of energy resulting from the tidal disturbances at a close encounter between 2 nebulae is large enough to effect a capture. The tidal deformations of 2 models of stellar systems, passing each other at a small distance, are studied by reconstructing, piece by piece, the orbits described by the individual mass elements. The difficulty of integrating the total gravitational force acting upon a certain element at a certain point of time is solved by replacing gravitation by light. The mass elements are represented by light-bulbs, the c.p. being $\propto$ mass, and the total light is measured by a photocell. The nebulae are assumed to have a flattened shape, and

each is represented by 37 light-bulbs. It is found that the tidal deformations cause an increase in the attraction between the 2 objects, the increase reaching its max. when the nebulae are separating, i.e. after the passage. The resulting loss of energy is comparatively large and may, in favourable cases, effect a capture. The spiral arms developing during the encounter represent an interesting byproduct of the investigation. The direction of the arms depends on the direction of rotation of the nebulae with respect to the direction of their space motions.

998 523.852

Galactic absorption and apparent distribution of spectral types. ALTER, G. *Mon. Not. Roy. Astr. Soc.*, 101, 8, *pp.* 381–387, 1941.—An attempt is made to derive the relation between true star distances and those determined by observed CI, assuming various conditions of interfering absorbing matter. It is shown that the average mixture of spectral types is falsified by this interference, and the nature of this falsification is discussed. An instance, taken from a CI investigation in a region of absorbing clouds, shows good agreement with the deductions.

999 523.852

The galactic structure in Taurus. III. Density gradients from spectral type distribution and IV. The dark nebula in Taurus. MCCUSKEY, S. W. *Astrophys. J.*, 94, *pp.* 468–481, *Nov.*, 1941.—[See Abstr. 3194 (1939)]. The 2 040 spectra of an unpublished portion of the *Henry Draper Extension* centred at $\alpha\ 4^h00^m$, $\delta + 30°$ have been distributed according to intervals of apparent magnitude in 5 subregions of the Taurus area. Colour-excess determinations for 450 early-type stars, obtained from blue-yellow colour indices, indicate an absorption of 2·0 mag. in photographic light for 4 of the 5 subregions. In the fifth subregion, that at highest galactic latitude ($b = -18°$), the absorption amounts to only 1·0 mag. In all cases the absorption seems to be complete at 200 parsecs. Space-density analyses indicate that the stars thin out rapidly with distance, the density at 400 parsecs being 20% of that at 100 parsecs. The intrinsically bright stars in region I ($b = -11°$) are 2 to 4 times more numerous at distances of 250–400 parsecs than in the region near the sun. In regions II and III ($b = -15°$ and $-18°$) the space density of the giant stars remains sensibly const. or decreases slightly with the distance in the interval 100–400 parsecs. A comparison of the luminosity function indicates a 2- to 4-fold excess of stars with $M < +2$ and a deficiency of stars with $+2 < M < +6$. The latter are only 45% as numerous as in the immediate vicinity of the sun. Four areas of dense nebulosity have absorptions of 2·7, 4·9, 3·5 and 3·0 mag. in photographic light. The nebula apparently sets in at 113 ± 39 (m.e.) parsecs.

1000 523.87

Hydrogen emission in 25 Cygni. HILTNER, W. A. *Astrophys. J.*, 94, *p.* 549, *Nov.*, 1941.

1001 523.873

The classification of the red carbon stars. KEENAN, P. C., AND MORGAN, W. W. *Astrophys. J.*, 94, *pp.* 501–510, *Nov.*, 1941.—The subdivisions of spectral classes *R* and *N* do not represent a consistent progression in temperature. A new classification is suggested on the basis of 4 criteria: (1) atomic-line ratios sensitive to temperature changes; (2) intensity gradient of the continuous spectrum in the yellow and red regions; (3) strength of the *D*-lines of sodium; and (4) intensity gradient within the λ5 635-band group of the molecule C_2. In the new classification the double max. shown by the C_2 bands in the *R-N* system disappears and is replaced by a single broad max. The lithium star, WZ Cassiopeiae, whose spectral type in the *R-N* system is *N1p* is reclassified at the low-temperature end of the carbon sequence; it appears to be the coolest carbon star known, and the great strength of Li may be explained. A group of 5 carbon stars has been found which is characterized by extreme weakness of the atomic lines in the photographic region. The bands of CH occur with great strength in their spectra; in addition, all 5 stars have very high radial velocities. The intensities of the carbon bands vary greatly among stars of the same subclass; this is evidence of different abundances of carbon in the atmospheres of different stars.

1002 523.874

On the radial-velocity curve of δ Cephei. BRUCK, H. A., AND GREEN, H. E. *Mon. Not. Roy. Astr. Soc.*, 101, 8, *pp.* 376–380, 1941.—Cambridge 4-prism spectrograms of δ Cephei do not indicate any definite relative displacements between lines of different atmospheric level, confirming thereby earlier negative results of Petrie and Jacobsen. There may exist small differences between the velocity curves of groups of neutral iron and ionized Ti lines, and there is evidence for the existence of relative shifts in the case of the neutral Ca line λ 4 425·6.

See Abstr. 994 523.874 : 523.841

1003 523.99

Occultations of stars by the moon observed at the Nizamiah Observatory, Hyderabad, during the year 1940. *Mon. Not. Roy. Astr. Soc.*, 101, 8, *pp.* 388–389, 1941.

1004 523.99

Occultations of stars by the moon observed at Melbourne University in 1940. BALDWIN, J. M. *Mon. Not. Roy. Astr. Soc.*, 101, 8, *p.* 390, 1941.

1005 523.99

Occultations observed at Teddington during 1939 and 1940. HAUGHTON, J. L. *Mon. Not. Roy. Astr. Soc.*, 101, 8, *p.* 391, 1941.

PHYSICS

1006 53 : 7

The physics of art. RAWLINS, F. I. G. *J. Sci. Instrum.*, 19, *pp.* 17–22, *Feb.*, 1942.—Non-destructive tests of works of art involve X-ray, ultra-violet and infra-red photography, optical and spectrographic examination, colorimetry etc., and restoration by electro-endosmosis. Presentation involves illumination and optical principles. E. H. W. B.

GENERAL PRINCIPLES

1007 530.131

A new table of values of the general physical constants (as of August, 1941). BIRGE, R. T. *Rev. Mod. Phys.*, 13, *pp.* 233–239, *Oct.*, 1941.

1008 530.14

The forces on an electron, according to Dirac's wave equation. LEES, A. *Phil. Mag.*, 33, *pp.* 131–137, *Feb.*, 1942.—It is proved that the forces consist of a purely internal system of stresses together with those forces which would be exerted upon it by the external electro-magnetic field according to classical principles.

MECHANICS

1009 531.19

On the determination of intermolecular energies by inductive analysis. ORR, W. J. C. *Proc. Camb. Phil. Soc.*, 38, *pp.* 224–230, *April*, 1942.—For a direct comparison of the individual attractive and repulsive terms of an intermolecular potential determined by the inductive analysis of thermodynamic data with the same terms calculated by quantal methods, it is shown that the analyses may be carried out to a first approximation with an intermolecular potential of the form $\phi(R) = Pe^{-aR} - A_1/R^6 - A_2/R^8$. For mathematical convenience, in place of the above expression, 2 potential functions are considered. It is pointed out that for such simple atoms or molecules as the rare gases, oxygen, nitrogen and methane, further simplifications can be made for application of the method to the experimental data. H. H. HO.

1010 531.19 : 541.123.4

Statistical mechanics of binary systems. FUCHS, K. *Proc. Roy. Soc. A*, 179, *pp.* 340–361, *Jan.* 23, 1942.—Mayer's method for the expansion of the partition function of a gas is adapted to the calculation of the partition function of a binary solid solution. The partition function is expanded in powers of the atomic fraction. Singularities in this expansion correspond to a phase transition. The singularity can be calculated in the simplest case of a binary solution with a 2-phase region. This case is treated in full; the limits of solubility and the sp. ht. are obtained. The latter is discontinuous at the phase boundaries.

1011 531.224.2 = 3

Approximate determination of breaking load. EVERTS, G. *Schweiz. Bauztg*, 118, *pp.* 261–263, *Nov.* 29, 1941.—The theory of a method is given for the approx. determination of the breaking load of girders with variable moment of inertia. It follows, in its essential features, Vianello's method. By employing Barta's average principle it is, however, possible to estimate to what extent the result deviates from the exact solution. The method is exemplified by the case of a girder fixed at the ends to 2 supports in the same horizontal. G. E. A.

1012 531.257

Correct design of rigid structures. GOTTSCHALK, O. *J. Franklin Inst.*, 232, *pp.* 553–578, *Dec.*, 1941.—A scheme for the simplification of methods. The author sets out 2 principles to be followed: (1) The correct statical calculation of buildings in 2 separate steps, the analysis of the structure and the computation of stresses produced by loads; (2) the analysis is a purely geometrical operation based on 4 given equations applied in accordance with the conditions of equilibrium and the geometrical relations in deformed models. The 4 simple equations are all that is required for the correct analysis of structures, and give immediate results which at present are obtained only by the most advanced abstract methods. The paper enters into details on particular points in design, and numerical examples illustrating the method are worked out. [See Abstr. 1761 (1929)]. G. E. A.

1013 531.31

Some comments on the article by C. G. Pendse. "A note on the definition and determination of mass in Newtonian mechanics." DRAPER, G. H. **Observations on G. H. Draper's paper entitled "Some comments on the article by C. G. Pendse."** PENDSE, C. G. *Phil. Mag.*, 33, *pp.* 90–95, *Feb.*, 1942.—Correspondence. [See Abstr. 5218 (1937)].

1014 531.51 = 3

Gravitational effects between pole-dipole particles. PAPAPETROU, A. *Z. Phys.*, 116, 5–6, *pp.* 298–309, 1940.—The gravitational force is investigated between 2 pole-dipole particles which macroscopically are at rest. When the particles are far away from each other, this force, averaged over the time and the phase of the internal motions of both particles, is identical with Newton's attraction between masses. The instantaneous values of the gravitational force, however, show large deviations from this average. The results are discussed from the point of view of a pole-dipole particle as representing the classical model of the spinning electron. O. O.

1015 531.66 = 3

Railway impacts. GROSSMAN, K. H. *Schweiz. Bauztg*, 118, *pp.* 250–251, *Nov.* 22, 1941.—An investigation of the shaking caused when railway carriages are subjected to periodic vertical impulses as the carriage wheels cross the gaps between the rails. Simplifying the masses to a schematic wheel, spring, and mass resting on the spring, it is found that the impulse transmitted by the wheel is proportional to the weight of the wheel and the gap width and, in the roughest approximation, is independent of the speed of the train. The mass on the spring undergoes sudden upward periodic changes of velocity of small magnitude. In determining the effect of the impulses on the top mass a working rule is obtained that, to avoid vertical shaking, either the spring constant should be small or the ratio of displacing force to wheel mass should be large. G. E. A.

1016 531.662

Some interesting aspects of the impact ball apparatus. CHAPMAN, S. *Amer. J. Phys.*, 9, *pp.* 357–360, *Dec.*, 1941.—A row of similar steel balls just touching one another is hung in one plane by bifilar suspensions. In a long row, if 4 balls are drawn out and then released, 4 balls fly out at the other end after the impact. If the balls drawn out are replaced by a single ball, the effect obtained is not the same. This and other effects are explained on the basis of sequence of impacts by making step-by-step calculations. The coeff. of restitution and time of contact are graphed as functions of the relative speed before impact, and diagrams and oscillogram photographs are given of complete 2-collision and 4-collision cycles for 3 balls. Hertz's law, that the time of contact is inversely proportional to the $\frac{1}{5}$th power of the relative velocity, is quantitatively verified. G. E. A.

See Abstr. 1155 531.7 : 548

1017 531.731.2

A simple apparatus for the direct determination of the volume of small irregular objects. SMALLMAN, B. N. *Proc. Roy. Soc. Edinb. B*, 61, 2, *pp.* 186–187, 1942.—The principle is that of simple displacement. Consistent results may be obtained with objects as small as 0·007 ml.

1018 531.75

Determination of moisture. VINCENT, R. S., AND SIMONS, A. *Nature, Lond.*, 149, *p.* 170, *Feb.* 7, 1942.

See Abstr. 1028 531.756 : 532.612 : 532.77

1019 531.781 : 621.317.39

The measurement of small friction torques. *Engineering*, 153, *p.* 17, *Jan.* 2, 1942.—[Abstr. 547 B (1942)].

1020 531.787 : 621.317.39

The electrical capacitance diaphragm manometer. LILLY, J. C. *Rev. Sci. Instrum.*, 13, *pp.* 34–37, *Jan.*, 1942.—[Abstr. 548 B (1942)].

LIQUIDS

See Abstr. 1140 532.1 : 541.18 : 621.315.611 : 621.3.015.51

1021 532.13 = 3

On the viscosity of acetyl cellulose as dependent on concentration. TAKEI, M., AND ERBRING, H. *Kolloid Z.*, 95, *pp.* 207–212, *May*, 1941.—Measurements are used for establishing corrections for the various empirical and semi-empirical formulae representing the concentration function of viscosity [Abstr. 1409 (1936), 386 (1942)]. The influence of the solvents is shown to be dependent on a combined function of interface tension and dielectric quantities. R. N.

1022 532.13

The "Dobbie–McInnes" ball-and-bucket viscometer. *Engineering*, 153, *pp.* 6–7, *Jan.* 2, 1942.—A new viscometer comprises a form of bucket filled with the test liquid and an inserted ball. Removal of a platform allows the bucket to fall at a rate dependent on the viscosity. The new c.g.s. units are described. Readings are given direct of dynamic viscosity and, to convert to cinematic viscosity, it is only necessary to divide by the density. E. H. W. B.

1023 532.596

Waves and tidal streams. UNNA, P. J. H. *Nature, Lond.*, 149, *pp.* 219–220, *Feb.* 21, 1942.

1024 532.61.08

Rotating-bubble method for the determination of surface and interfacial tensions. VONNEGUT, B. *Rev. Sci. Instrum.*, 13, *pp.* 6–9, *Jan.*, 1942.—A new method for the measurement of surface and interfacial tensions is suggested. The 2 phases to be investigated are placed in a closed container which is rotated at a known speed about a horizontal axis. Under the influence of the forces of rotation and of surface tension the lighter phase will take the equilibrium shape of an elongated bubble along the axis of rotation. If the length of the bubble is made large compared with the radius, the shape of the bubble can be closely approximated by a circular cylinder with hemispherical ends. For the case of a long bubble expressions are derived for the surface tension as a function of the bubble dimensions and for the shape of the bubble end.

See Abstr. 1028 532.612 : 531.756 : 532.77

1025 532.613.4 = 3

Formation of super-molecules in interfaces. DUNKEN, H., FREDENHAGEN, I., AND WOLF, K. L. *Kolloid Z.*, 95, *pp.* 186–188, *May*, 1941.—With the method previously described (Abstr. 48 (1942)] a sharp min. value was found in the curve representing the functional relation between interfacial tension and conc. for Hg against solutions of aliphatic acids in heptane and cyclohexane at very small conc. In order to prove that the behaviour observed is due to the stronger interface activity of single molecules within the acid, a model was made with chlorobenzene and bromobenzene in heptane, the former representing double molecules and the latter the more active single molecules. Solutions in benzene show a different behaviour for which also an explanation is given. R. N.

1026 532.63

Some preliminary considerations concerning concentration of oxygen in tissue. BLOCH, I. *Bull. Math. Biophys.*, 3, *pp.* 121–126, *Dec.*, 1941.—An approx. expression for the average conc. of oxygen in vascular tissue is derived on the basis of certain assumptions. These assumptions are then analysed, and the inadequacies of the approx. derivation are pointed out; possibilities as to the method and results of more exact derivations are briefly discussed.

See Abstr. 1121 532.7 : 541.6 : 539.2

See Abstr. 1141 532.71 : 541.14 : 541.18

See Abstr. 1151 532.71 : 541.8

See Abstr. 1152 532.71 : 541.8 : 541.18.045.2

See Abstr. 1146 532.72 : 541.182

1027 532.73

The general membrane equilibrium equation: its simple derivation and some of its biological implications. MORALES, M. F., AND SHOCK, N. W. *Bull. Math. Biophys.*, 3, *pp.* 153–160, *Dec.*, 1941.—On the basis of thermodynamic considerations, expressions for the relation between the *i*-th and *j*-th ions and solvent separated into subsystems by a semi-permeable membrane are derived. From this basic equation expressions for the transfer of solvent attending solute changes are developed. The application of these expressions to biological systems involving solvent transfer, as in cellular growth, chloride shift in the red blood cell, imbibition of water into cells, is discussed.

1028 532.77 : 532.612 : 531.756

Surface tension, liquid density and vapour density, of sulphur dioxide solutions of potassium thiocyanate at 10°, 15°, 20° and 25°C. EVERSOLE, W. G., WAGNER, G. H., AND BAILEY, G. C. *J. Phys. Chem.*, 45, *pp.* 1388–1397, *Dec.*, 1941.—An apparatus and technique are described for measuring vapour density, liquid density and surface tension, on the same solution in a closed system. By its means, SO_2 solutions of KCNS have been measured over the conc. range 0 to 0·8 molal at 10°, 15°, 20° and 25°C. It is found that the Onsager–Samaras theory agrees qualitatively with the increase in the relative surface tension with conc. in the dilute conc. range of the SO_2 solutions. A very full list of references is included. H. H. HO.

1029 532.77 : 542.63

Diffusion coefficients in solution: an improved method for calculating *D* as a function of concentration. EVERSOLE, W. G., PETERSON, J. D., AND KINDSVATER, H. M. *J. Phys. Chem.*, 45, *pp.* 1398–1403, *Dec.*, 1941.—The method proposed by Eversole and Doughty [Abstr. 4018 (1937) and 3288 (1935)], for the calculation of diffusion coefficients is in error except at the lowest concentrations, and a new equation is now derived which expresses *D* as a function of conc. for all concentrations. H. H. HO.

See Abstr. 1074 532.782 : 541.18 : 537.226.2 : 536.421

GASES

1030 533.15 = 3

The self-diffusion of HCl and HBr. BRAUNE, H., AND ZEHLE, F. *Z. phys. Chem. B*, 49, *pp.* 247–256, *July*, 1941.—The diffusion coeff. of DCl against HCl and of DBr against HBr were measured. As the difference between the thermal speeds of the isotopes is very small, the diffusions observed may be considered as self-diffusions. The method of measurement is described and illustrated. The following values were found: $D_{DCl-HCl} = 0{\cdot}1246$ at 21·8°C. and $D_{DBr-HBr} = 0{\cdot}0792$ at 22·1°C. The results are discussed, especially with regard to the connections between diffusion coeff., inner friction, density and repulsion exponential. R. N.

1031 533.662

Screw-propeller theory. TAYLOR, J. L. *Trans. N.-E. Cst Instn Engrs Shipb.*, [12 *pp*], 1942.—An account of propeller theory, collected from various sources and with certain additions, in a form suitable for immediate practical application. A short statement is first given of the simple momentum theory which is extended to include rotational as well as axial inflow. The Glauert theory for infinite number of blades also uses the momentum inflow values, but these are now calculated for each radius individually and applied to the known aerofoil characteristic to predict the performance of each blade section, and hence that of the screw as a whole. More nearly accurate are the inflows of the Goldstein vortex theory, which allows for finite number of blades and so-called "tip effect," and performances so predicted are in reasonable agreement with model and full-scale data. Finally, an approx. method of calculating the pressure distribution over the blade sections is given, for any arbitrary shape of section, and the application to cavitation conditions discussed.

1032 533.7 = 3

The average tarrying distance. BENNEWITZ, K. *Z. phys. Chem. B*, 49, *pp.* 293–296, *Aug.*, 1941.—For a partly open space the average tarrying distance and the average tarrying time are defined and calculated for the case that a molecule enters and leaves the space through an opening of known area. If the potentials inside and outside the space are equal, the average tarrying distance is shown to be 4 times the ratio of the volume of the space to the area of the opening. For different but const. potentials inside and outside the space, a modified opening area is calculated having an exponential term dependent on potential energy and temperature. A formal analogy is shown to exist between average tarrying distance and m.f.p. of the molecules, their ratio being equal to the ratio of "inner surface," i.e. the total surface of the molecules considered as spheres, and opening surface. R. N.

SOUND. VIBRATIONS

1033 534.14

Influence of the shape of blade section on singing of propellers. HUGHES, G. *Trans. Instn Engrs Shipb. Scot.*, 85, *pp.* 55–130, *Jan.*; *Disc.*, 131–168, *Feb.*, 1942.—Rapid expansion of the flow over the back of the propeller blade near the leading edge as the blade passes out of the region of high wake causes an increase in turbulence accompanied by a sudden change of force which starts the singing vibration. The film breakdown is prevented by limiting the rate of change of velocity during the expansion or by preventing the establishment of the conditions which precede the breakdown. Factors which control breakdown are: shape of blade sections at the leading edge, slip at which sections work, the manner in which this varies round the disc, and the speed of rotation. Statistical analysis gives a high degree of separation between quiet and singing propellers. The theory provides satisfactory explanations for the chief phenomena observed. A system of design is given which should avoid the conditions for singing. G. E. A.

1034 534.14 : 788

Lip vibrations in a cornet mouthpiece. MARTIN, D. W. *J. Acoust. Soc. Amer.*, 13, *pp.* 305–308, *Jan.*, 1942.

1035 534.14 : 788

Directivity and the acoustic spectra of brass wind instruments. MARTIN, D. W. *J. Acoust. Soc. Amer.*, 13, *pp.* 309–313, *Jan.*, 1942.

1036 534.221

The velocity of sound in air. HARDY, H. C., TELFAIR, D., AND PIELEMEIER, W. H. *J. Acoust. Soc. Amer.*, 13, *pp.* 226–233, *Jan.*, 1942.—A rigorous equation is set up for the velocity of sound in gases. This is used to calculate the velocity of sound in dry air at standard conditions from data taken in independent measurements. The result of this calculation is 331·45 ± 0·05 m./s. An extensive survey of previous reported measurements has been made. After proper corrections are taken into account, the weighted mean is 331·46 ± 0·05 m./s. The results of very precise interferometer measurements by the authors give 331·44 ± 0·05 m./s.

1037 534.3

The comma in music. II–III. DUFTON, A. F. *Phil. Mag.*, 33, *pp.* 151–156, *Feb.*, 1942.—[See Abstr. 2141 (1941)].

1038 534.322.3 : 612.85

Industrial noises and industrial deafness. ROSENBLITH, W. A. *J. Acoust. Soc. Amer.*, 13, *pp.* 220–225, *Jan.*, 1942.—Measurements on the intensity and the frequency distribution of industrial noises and the hearing losses of industrial workers show: (*a*) some degree of correlation between the average noise level and the temporary and permanent hearing losses; (*b*) an almost complete localization of the permanent hearing loss in the region above 1 500 c./s. (with a max. at 6 000 c./s.), while the most important components of industrial noises are practically always

below this limit; (*c*) some correlation between the amount of temporary and permanent hearing losses for h.f.; (*d*) a very small permanent hearing loss for low frequencies with a very rapid recuperation from temporary loss in this region.

1039 534.37 : 539.217.1

Acoustic impedance of porous materials. BERANEK, L. L. *J. Acoust. Soc. Amer.*, 13, *pp.* 248-260, *Jan.*, 1942.—A simple theory is presented for predicting the normal acoustic impedance of isotropic porous materials in terms of 3 simple const., namely flow resistance, porosity and effective dynamic mass, of the enclosed gas. The variation of normal impedance with angle of incidence for spaced-out or rigidly backed samples is treated. A possibility is discussed that gaseous expansions are isothermal over most of the a.f. range in materials made of finely divided particles. Many isotropic acoustical materials fall in this class. An air cavity thus becomes less stiff to dynamic compression when a very porous finely divided material is added to the cavity than when the material is not present. The results are checked against experimental data. A simple method is described for measuring the porosity of a material.

See Abstr. 1084 534.39 : 537.312

1040 534.414

Laboratory experiments with acoustic resonators. COPELAND, P. L. *Amer. J. Phys.*, 9, *pp.* 375–378, *Dec.*, 1941.—The resonators were formed from 2 lengths of cylindrical metal tubing of different diameters connected by a flange and were adjusted for max. resonance to tuning forks by immersion in water. With simplified assumptions the frequencies of the resonator are calculated and give satisfactory agreement with the accepted frequencies of the forks. Other forms used include multiple-coupled resonators in which the change in resonance frequency is followed with each additional coupling. The experiments suggest how a low-pass filter can be built from coupled resonators. When the number of units is large, the resonance frequencies cannot be separated, and all below a certain critical value are reduced in intensity or "attenuated." G. E. A.

1041 534.7 : 621.385.8

Methods for measuring the performance of hearing-aids. ROMANOW, F. F. *J. Acoust. Soc. Amer.*, 13, *pp.* 294–304, *Jan.*, 1942.—[Abstr. 579 B (1942)].

1042 534.81

Silvering of wax surfaces used for preparing gramophone matrices. MAJUMDAR, V. D. *Sci. and Cult.*, 7, *pp.* 270–271, *Nov.*, 1941.

1043 534.81

Properties of the dulled lacquer cutting stylus. LEBEL, C. J. *J. Acoust. Soc. Amer.*, 13, *pp.* 265–273, *Jan.*, 1942.—The combined cutting and burnishing action of a standard lacquer cutting stylus is explained. It is emphasized that cutting and burnishing take place simultaneously at l.f.; but that at h.f. the operations are separated by a discrete wavelength fraction; phase shift and attenuation result. These depend upon circumferential velocity, hence are worst at low rotational speed and small distance from the centre of the record. The experimental study is confined to $33\frac{1}{3}$ r.p.m. recordings at various diameters, and the recorded velocity as a function of frequency and diameter is determined for needles with different lengths of dulling. The effect of amount of dulling on surface noise is determined, and a technique for comparing the perfection of action of cutting and burnishing is given. It is emphasized that for modern-quality standards the length of dulling must be restricted and that the resulting increase in surface noise is not of great importance.

1044 534.81

A large-radius stylus for the reproduction of lateral cut phonograph records. REID, J. D. *J. Acoust. Soc. Amer.*, 13, *pp.* 274–275, *Jan.*, 1942.

1045 534.81

Tracing distortion in the reproduction of constant amplitude recordings. SEPMEYER, L. W. *J. Acoust. Soc. Amer.*, 13, *pp.* 276–280, *Jan.*, 1942.

1046 534.81

A noise- and wear-reducing phonograph reproducer with controlled response. GOLDSMITH, F. H. *J. Acoust. Soc. Amer.*, 13, *pp.* 281–285, *Jan.*, 1942.

1047 534.81

The correlation between elastic deformation and vertical forces in lateral recording. BEGUN, S. J., AND LYNCH, T. E. *J. Acoust. Soc. Amer.*, 13, *pp.* 284–287, *Jan.*, 1942.

1048 534.81

The recording laboratory in the Library of Congress. WIESNER, J. B. *J. Acoust. Soc. Amer.*, 13, *pp.* 288–293, *Jan.*, 1942.

1049 534.811

Problem of instabilities of higher orders in a seismometer. I–III. KANAI, K., AND SEZAWA, K. *Bull. Earthq. Res. Inst., Tokyo*, 18, *pp.* 483–496, *Dec.*, 1940; 19, *pp.* 9–13, *March, and pp.* 177–184, *June*, 1941.—I. In the investigation use was made of the vibration table [see Abstr. 719 (1942)] to test a pendulum of the Ishimoto type. The table oscillated in a direction at right angles to the pendulum movement. Instability peaks appeared at 1/2, 2/2, etc., times the natural period of the pendulum, represented by I, II, IV, VI, etc. The frequencies for instability were also ascertained mathematically, and these included all the orders, viz., I, II, III, IV, V, etc. It was also shown that, if the damping is great, instability of any order is unlikely except when the vibration amplitude of the ground is extremely large. II. A seismometer of the Ewing or similar type can be made stable provided that suitable viscous damping is supplied. III. Tests were made on the instability conditions 3/2 and 4/2, using horizontal and vertical vibration tables. Although the instabilities were not of the usual kind, in which the vibration augments indefinitely with time, the sensitivity becomes abnormally large for certain frequencies of ground movements at right angles to the movable direction of the seismometer. G. E. A.

LIGHT

See Abstr. 1135 535.24 : 541.115

1050 535.243 = 3

Spectroscopic investigation of association of normal primary alcohols. KREUZER, J., AND MECKE, R. *Z. phys. Chem. B*, 49, *pp.* 309–323, *Aug.*, 1941.—With a very accurate spectrophotometer, the optical system of which is described and illustrated, extinction curves

were determined, especially at the sharp OH band λ9 680, for various primary alcohols. R. N.

1051 535.243 : 535.511

A recording spectrophotometer and spectropolarimeter. BRODE, W. R., AND JONES, C. H. *J. Opt. Soc. Amer.*, 31, *pp.* 743–749, *Dec.*, 1941.—A description is given of a phototype spectrophotometer and the theory of the instrument is discussed when used (*a*) as a photometer, (*b*) as a polarimeter. Other applications, e.g. to obtain a continuous record of the rotation due to optical activity as a function of frequency, are also discussed. A. H.

1052 535.245

Low-brightness meter. TAYLOR, A. H. *J. Opt. Soc. Amer.*, 31, *pp.* 738–739, *Dec.*, 1941. *Erratum*, 32, *p.* 34, *Jan.*, 1942.—Describes a portable brightness meter designed for the measurement of low values of brightness such as those of the night sky. The instrument is calibrated in photopic units (foot-lamberts) and the range is from 0·1 to 5×10^{-6}. The brightness of the zenith sky on a clear moonless night is about 150×10^{-6} foot-lambert (equivalent f.c.). J. W. T. W.

See Abstr. 1113 535.247 : 539.16.08

See Abstr. 1089, 1090 535.3 : 537.531

See Abstr. 1091 535.3 : 537.531 : 548

1053 535.31

Optical surfaces of Descartes and Huygens. FARWELL, H. W. *Amer. J. Phys.*, 9, *pp.* 255–263, *Oct.*, 1941.—The general equation of the cartesian ovals is given and the various special cases leading to familiar and less familiar aplanatic reflecting and refracting surfaces are derived and illustrated. The problem of determining a combination of surfaces to give a point image of a point object after an initial refraction at a plane surface is solved by graphical methods, employing the properties of evolutes. W. S. S.

1054 535.312 : 535.341

Reflection-transmission relationships in sheet materials. LAUNER, H. F. *J. Res. Nat. Bur. Stand., Wash.*, 27, *pp.* 429–442, *Nov.*, 1941.—A detailed study was made of the method of determining the reflectance of translucent sheet materials which is based on the fact that the transmission of 2 superposed sheets depends not only on the transmission of each sheet but also on the reflection factors of the opposed faces. The materials studied were commercial papers, a plastic, and photographic plate glass. The reflectances derived from measured transmissions by the above method were compared with directly determined reflectances and the validity of the method established over a wide range of wavelengths and reflectances. The effects of angle of incidence and view, of the presence of specular reflection and of fluorescence, are discussed. The application of the method to the infra-red is also considered. W. S. S.

1055 535.317.1

Illumination of the image formed by wide-angle photographic objectives. SLUSSAREFF, G. *J. Phys., U.S.S.R.*, 4, 6, *pp.* 537–545, 1941.—The illumination at a point *P* in the image formed by a photographic objective is commonly assumed to be proportional to $\cos^4\theta$ where θ is the angle with the axis of the principal ray forming the image of *P*. The author shows that this and allied formulae are defective because they ignore aberrations in the plane of the exit or entrance pupil which may produce effects comparable with the cosine factor. An exact formula is derived and is used to examine various devices for reducing the amount of the variation in illumination. Monocentric objectives reduce the variation to the first power of $\cos\theta$ but require a spherical receiving surface. It is shown that by utilizing a combination of coma and barrel distortion a nearly uniform illumination of the photographic plate can be obtained. W. S. S.

1056 535.317.6

Note on an approx. method of calculating non-spherical refracting surfaces to remove spherical aberration. HOUGHTON, J. L. *J. Sci. Instrum.*, 19, *pp.* 43–44, *March*, 1942.—An approx. but simple method of designing a non-spherical last surface of a lens system to remove spherical aberration is described. The axial thickness of the last component and the radius of curvature at the pole of the last surface are changed so that the paraxial focus coincides with that of a zonal ray. The mathematical relations thus obtained enable terms to the 6th order in the series representing the surface to be found. The method is of use in systems which are uncorrected for spherical aberration in any zone.

1057 535.338

Rotational structure of the Birge–Hopfield bands of N_2. SPINKS, J. W. T. *Canad. J. Res. A*, 20, *pp.* 1–5, *Jan.*, 1942.—Bands of the $a^1\prod_u \rightarrow X^1\sum_g^+$ system in N_2 (Birge–Hopfield bands) have been photographed and measured. *P*, *Q* and *R* branches are recorded and the identification of the transition as $^1\prod \rightarrow {}^1\sum$ is definitely confirmed. B', B'', α' and α'' values, are presented.

1058 535.338

The high-pressure carbon band system. ASUNDI, R. K., AND PANT, D. D. *Curr. Sci.*, 10, *pp.* 520–521, *Dec.*, 1941.

1059 535.338

The ultra-violet band spectrum of mercury iodide. SASTRY, M. G. *Curr. Sci.*, 10, *p.* 521, *Dec.*, 1941.

1060 535.338

Raman spectra of substituted arsenic acids. GUHA, M. P. *Sci. and Cult.*, 7, *pp.* 315–316, *Dec.*, 1941.

1061 535.338 : 537.12

The values of *R* and of *e/m*, from the spectra of H, D and He^+. BIRGE, R. T. *Phys. Rev.*, 60, *pp.* 766–785, *Dec.* 1, 1941.—Earlier data [Abstr. 2139 (1940), 1007 (1942)] have been recalculated to obtain values of the Rydberg const. for H and D and, from these, for He and for infinite mass. Explicit equations are derived for all the necessary calculations. The value of R_∞ now obtained is appreciably higher than before, but it is surprisingly low, compared with the value commonly used in the past. About $\frac{1}{5}$ of the proposed change in the value of R_∞ is due to new values of the index of refraction of air. Recent work on this subject is summarized and put in a form suitable for use by spectroscopists. The data lead also to values of *E* (atom. wt. of the electron) and *e/m*. The explicit equations needed are derived. All recent precision

work on e/m is recalculated. Although the data are not as consistent as could be desired, there are no really serious discrepancies. If the adopted value of the Farad were raised by about 30 Coulombs, almost complete consistency of the e/m values would be obtained. There is no direct experimental evidence to justify such a change.

1062 535.338 : 539.152,1 = 3

The interpretation of perturbations in nitrogen bands. GERÖ, L., AND SCHMID, R. *Z. Phys.*, 116, 3–4, *pp.* 246–248, 1940.—The part played by the nuclear spin has not yet been taken into account in the treatment of the perturbations in band spectra. Some perturbations, hitherto not explained, in the N_2 and N_2^+ bands are satisfactorily explained by replacing the conventional J-quantum number of molecules with nuclear spin with a quantum number expressing the total angular momentum. O. O.

1063 535.338 : 539.153 = 3

The energy levels of lead-hydride. GERÖ, L. *Z. Phys.*, 116, 5–6, *pp.* 379–384, 1940.—The anomalous behaviour of the rotation evident in the lead-hydride bands $^2\Sigma \rightarrow {}^2\Sigma$ is explained by perturbations characterized by $\Delta\lambda = 0$. The most probable positions of the perturbed and perturbing energy levels are found. The excited lead-hydride terms cannot dissociate, so that unexcited lead atoms are produced. O. O.

See Abstr. 1142 535.34 : 541.18

See Abstr. 1054 535.341 : 535.312

1064 535.343.3 = 3

The influence of inter-molecular fields on the N–H oscillation. JUNG, G., AND WYGASCH, E. *Z. phys. Chem. B*, 49, *pp.* 205–218, *July*, 1941.—After repeating some measurements on NH_3 [Abstr. 438, 5003 (1932)] in order to establish more exactly the linear dependence of the shift on concentration, similar measurements were made on CH_3NH_2 in the gaseous and liquid states and dissolved in water, methyl-, ethyl- and propyl-alcohol, benzene and dioxane. The largest shift was found with liquid CH_3NH_2. For the solutions the shift is a linear function of conc. if normality is used as a measure. The straight lines for different solvents converge at the points corresponding to liquid NH_3 and CH_3NH_2, respectively. The shifts observed with benzene and dioxane used as solvents are considerably greater than those with water or alcohol. This is tentatively explained by a stronger screening effect by water and alcohols on the inter-molecular forces. R. N.

1065 535.343.4 = 3

The absorption spectrum of water vapour in the spectral range from 0·15 to 0·5 mm. wavelength. HOPF, M. *Z. Phys.*, 116, 5–6, *pp.* 310–316, 1940.— A high-intensity spectrometer for the extreme infra-red is described, which permits measurements in the spectral range from 150 to 400 μ with a slit width of 18 μ. Single absorption lines of water vapour were measured, and it was confirmed that the structure of the long-wavelength spectrum measured in the laboratory is largely determined by the absorption by water vapour. O. O.

1066 535.371

A photo-electric fluorimeter. WOODCOCK, A. H. *Canad. J. Res. D*, 19, *pp.* 253–257, *Sept.*, 1941.—A fluorimeter designed for the determination of vitamin B_1 as thiochrome and riboflavin is described. The instrument is entirely self-contained and simple to operate. It is capable of detecting thiochrome in concentrations as low as 0·005 μg./ml. and sufficiently stable to permit measurement of higher concentrations. By using vacuum-type photocells an electric eye can be used as a null indicator and the comparatively expensive galvanometer is eliminated.

See Abstr. 1156 535.39 : 548

1067 535.392 : 628.9

Wall materials and lighting. MOON, P. *J. Opt. Soc. Amer.*, 31, *pp.* 723–729, *Dec.*, 1941.—Gives the reflection factors and trichromatic coeff. of 87 wall materials and spectral reflection curves for 30 of them. These data are then used to calculate the effect of using any one of 8 typical materials, as regards the brightness of the wall and ceiling surfaces and the illumination on the working plane. The room is assumed to be cubical and the method of calculation is that developed by the author [Abstr. 1563 (1941)]. It is found that the illumination may vary over a range of 3 to 1 according to the wall material used. In the case of dark wall materials the ceiling brightness produces too great a contrast. On all counts light-coloured walls are recommended. J. W. T. W.

See Abstr. 1143 535.5 : 541.18

See Abstr. 1051 535.511 : 535.243

See Abstr. 1078 535.6 : 536.55

1068 535.735

A speed control for sector discs or similar equipment. LEE, R. H., AND CRISP, L. R. *Rev. Sci. Instrum.*, 12, *pp.* 607–608, *Dec.*, 1941.—The sector disc is driven at 60 r.p.m. via a continuously variable gear from a small synchronous motor. The gear change is proportional to the speed difference and is shown on counters. The optical equipment to maintain the constant speed is not claimed to be new. E. H. W. B.

See Abstr. 1144 535.822.4 : 541.18

1069 535.824.3

Coherence of rays in the formation of images in the microscope. ROGESTWENSKY, D. S. *J. Phys., U.S.S.R.*, 4, 4, *pp.* 293–317, 1941.—The earlier work of Abbe, Rayleigh, Mandelstam, van Cittert and others, on this problem is reviewed and a new analysis is put forward in which it is shown that the ratio of the apertures of the condenser and the objective is the factor determining the degree of non-coherence of the illumination. The question when the illumination of the object is equivalent to self-luminosity is discussed at length. The theory is applied to show the significance of coherence in the formation of the image of 2 adjacent infinitely narrow slits. New interpretations of some of Abbe's experiments are given. W. S. S.

1070 535.86

Use of the camera lucida for transcribing diagrams. DAWES, B. *Nature, Lond.*, 149, *p.* 140, *Jan.* 31, 1942.

HEAT

1071 536.24

Heat transfer to clouds of falling particles. JOHNSTONE, H. F., PIGFORD, R. L., AND CHAPIN, J. H.

Bull. Univ. Ill. Engng Exp. Sta., No. 330, [55 *pp.*], 1941—An account of an investigation carried out to give information essential to the design of plant for heating finely divided particles as they fall through a heated enclosure. The heat transfer from a hot furnace wall to the particles takes place mainly by convection in small furnaces, but the contribution due to radiation increases rapidly with increase of furnace diameter and of wall temperature. Equations are suggested for the estimation of both types of heat transfer and values of the essential constants are tabulated for various types of furnace. The experimental data are applied to the design of a flash calciner capable of decomposing 83·2 tons of zinc sulphite hydrate per day. R. W. P.

1072 536.244

Heat flow when the boundary condition is Newton's law. AWBERY, J. H. *Phil. Mag.*, 33, *pp.* 157–158, *Feb.*, 1942.—A correction [Abstr. 239 (1930)].

1073 536.413

Expansivity of a Vycor brand glass. SAUNDERS, J. B. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 51–55, *Jan.*, 1942.—In a study of a new glass (96% silica, glass No. 790) used in heat-resisting glassware, its expansivity is compared with that of fused quartz. A modification of Fizeau's method was used. The results indicate that the No. 790 glass has a coeff. of expansion approx. twice that of fused quartz at room temperature, an expansivity equal to fused quartz at approx. 300°C., and an expansivity $< \frac{1}{2}$ that for fused quartz, near 700°C.

1074 536.421 : 541.18 : 537.226.2 : 532.782

A method of minimizing supercooling and its application in the determination of freezing points from dielectric-const. measurements. SHAW, T. M. *Rev. Sci. Instrum.*, 13, *pp.* 2–5, *Jan.*, 1942.—The determination of the f.p. of water in colloidal systems from dielectric-const. measurements is unsatisfactory when supercooling occurs. A method is described for minimizing supercooling. Data showing the f.p. obtained for a Barnes soil at various moisture contents are included.

1075 536.423

The separation of liquid from vapour, using cyclones. POLLAK, A., AND WORK, L. T. *Trans. Amer. Soc. Mech. Engrs*, 64, *pp.* 31–40; *Disc.*, 41, *Jan.*, 1942.—Experiments with cyclones for separating liquids from vapours are described. The data conform to the equation $\log[L_v(V/L)^a] = b + cV$; where L_v is the entrainment or liquid remaining in the effluent vapour, V the vapour velocity, L the liquid velocity, all in lb./min./ft.^{2} of inlet-duct cross-section. Terms a, b and c, are const. associated with the equipment and its mode of operation. The principal source of the entrainment is shown to be the wall creep of liquid in the cyclone, impelled by the radial component of the vapour velocity.

1076 536.44 = 3

Investigations on the critical state. SCHRÖER, E. *Z. phys. Chem. B*, 49, *pp.* 271–278, *July*, 1941.—Apparatus previously described [Abstr. 140 (1928)] was further developed in order to enable the observer to measure not only the temperature but also the pressure within one series of tests, also for higher values of temperature and pressure. With this apparatus the critical state of naphthalene was investigated and its v.p. curve determined up to the critical point. The critical density was found to be 0·314 g./cm.^{3}. The linear relation between $\log p$ and $1/T$ was proved and, similarly, the linearity of van der Waals's v.p. curve. The const. of the latter shows that naphthalene is to be considered as a normal substance. R. N.

1077 536.5 : 621.183 = 3

Contact thermometers in the heat testing of steam plants. ZIMMERMANN, E. *VDI* [*Z. Ver dtsch. Ing.*], 84, *pp.* 393–395, *June* 8, 1940. [Abstr. 485 B (1942)].

1078 536.55 : 535.6

Temperature-indicating paints. *Elect. Times*, 101, *pp.* 484–485, *Jan.* 22, 1942.—Describes the characteristics of a range of paints now available which change colour when subjected to high temperature. Each paint has its individual basic colour which changes when the rated temperature is exceeded and does not alter on subsequent cooling. Some paints have only 1 change whereas others have as many as 6. The dividing line between changes is usually sharp and distinct, but where there are several changes there is some shading. Some of the many applications are briefly mentioned. A. P. W.

1079 536.633.4

Resonance method of measuring the ratio of the specific heats of a gas, C_p/C_v. III. Sulphur dioxide and nitrous oxide. CLARK, A. L., AND KATZ, L. *Canad. J. Res. A*, 19, *pp.* 111–115, *Sept.*, 1941.—A continuation of previous work [Abstr. 1596 (1940)]. The results for N_2O and SO_2 are shown.

1080 536.7 : 541.8

A thermodynamic theory of solutions of two liquids at all concentrations. FINCK, J. L. *J. Franklin Inst.*, 233, *pp.* 51–70, *Jan.*, 1942.—[See Abstr. 1219 (1940)]. Including catalysis in the basic thermodynamic considerations, the writer shows that the process of mixing 2 chemically pure liquids to form a solution is thermodynamically analogous to the evaporation of a liquid. Osmotic pressure is analogous to vapour pressure, and the interrelations between osmotic pressure and the e.m.f. of a concentration cell are developed. Finally, a mathematical relation is developed beween the lat. ht. of solution, the sp. vol. of the individual liquids and that of the solution, the conc. of the solution, the e.m.f. and electric charge of the conc. system. The entire treatment applies to conc. ranging from 0 to 100% of each component.

1081 536.717 : 541.183.2

The thermodynamic derivation of Fowler's adsorption isotherm. RUSHBROOKE, G. S. *Proc. Camb. Phil. Soc.*, 38, *pp.* 236–239, *April*, 1942.—Recently, Rushbrooke and Coulson [Abstr. 1734 (1940)] showed how Langmuir's isotherm could be derived thermodynamically by taking a simple model assembly, comprising a gas and surface phase, round an infinitesimal Carnot cycle. More precisely, it was shown that, if the energy, $-W(T)$, of the adsorbed phase per adsorbed atom, or molecule, is independent of the number, $N(p, T)$, of adsorbed atoms (or molecules, throughout), then thermodynamical requirements restrict the equation of an adsorption isotherm to a certain class of equations of which Langmuir's is the simplest example. In the present note it is shown that, if the restriction that W is independent of $N(p, T)$

is dropped, precisely analogous thermodynamical considerations restrict the equation of an adsorption isotherm to a more general class of equations. If W depends linearly upon N, Fowler's isotherms for critical adsorption are shown to be the simplest examples of equations of the new class. H. H. HO.

ELECTRICITY

See Abstr. 1061 537.12 : 535.338

1082 537.122 = 3

On the inner motion of electrons. III. HÖNL, H., AND PAPAPETROU, A. *Z. Phys.*, 116, 3–4, *pp.* 153–183, 1940.—The relation between Dirac electrons and pole-dipole particles is investigated. The correspondence can well be traced by differentiating between the odd and even parts of the operators of the Dirac electron and by computing typical values. The method is applied to the detail of the macro- and micro-motion of the electron, to the eigen-momentum, and to the energy function. In any case, an accurate correspondence is found which proves that the pole-dipole particles may be considered to be the classical model of the Dirac electron. [See Abstr. 2244, 3005 (1939)]. O. O.

See Abstr. 1074 537.226.2 : 532.782 : 541.18 : 536.421

See Abstr. 1106 537.226.2 : 539.133

1083 537.226.2 : 541.127

The rate of inversion of sucrose as a function of the dielectric constant of the solvent. PLANK, C. J., AND HUNT, H. *J. Phys. Chem.*, 45, *pp.* 1403–1415, *Dec.*, 1941.—The rate of inversion of sucrose has been determined in solvent mixtures containing varying percentages of dioxane and water. The reactions were catalysed by 0·02, 0·05 and 0·10 N HCl. The unimolecular constant, k, was found to increase as the percentage of dioxane was raised, and the change was closely approximated by the general equation, $\log (k/k_0) = 11 \cdot 6(1/D - 1/D_0)$; where k is the reaction-rate const. in the mixed solvent of dielectric constant D, k_0 and D_0 being the corresponding quantities for water. The effect was found to be the same for all 3 conc. of the catalyst. The speed of the reaction increased in a greater ratio than the ratio of the HCl conc. The sp. rotation of the invert sugar was found to decrease very sharply in proportion to the wt.% of dioxane in the solvent. H. H. HO.

1084 537.312 : 534.39 = 3

Electric conductivity of liquid dielectric substances as affected by h.f. sound. SEIDL, F. *Z. Phys.*, 116, 5–6, *pp.* 359–365, 1940.—The electric conductivity of hexane, toluene and carbon tetrachloride, is increased by h.f. sound. This effect is explained by processes similar to those occurring in dense gases. O. O.

1085 537.32 : 621.362 = 3

Calculation and optimum design of simple thermo-convertors (thermo-crosses). FISCHER, J. *Arch. Elektrotechn.*, 35, *pp.* 23–44, *Jan.* 25, 1941.—[Abstr. 573 B (1942)].

1086 537.523.5 : 621.365.2 = 3

Remarks on the chemistry of the high-current carbon arc. FINKELNBURG, W. *Z. phys. Chem. B*, 49, *pp.* 297–302, *Aug.*, 1941.—[Abstr. 574 B (1942)].

1087 537.525.5 : 621.314.653 : 621.3.064.4 = 3

Electrostatic extinction of the arc by the starving [de-ion] principle. MEINHARDT, H. *Arch. Elektrotechn.*, 35, *pp.* 85–98, *Feb.* 20, 1941.—[Abstr. 516 B (1942)].

1088 537.525.8 = 3

The significance of Steenbeck's minimum-principle. SEELIGER, R. *Z. Phys.*, 116, 3–4, *pp.* 207–213, 1940.—A physical interpretation of the minimum-principle is suggested. The main idea is that the positive column actually occupies the whole cross-section of the tube, but that the observer assumes a limit where the radial gradient of the light intensity comes to a certain threshold. The computations are carried through for a simple example. O. O.

1089 537.531 : 535.3

On Pisharoty's theory of the geometry of quantum reflection of X-rays. SIRKAR, S. C., AND BISHUI, B. M. *Sci. and Cult.*, 7, *pp.* 314–315, *Dec.*, 1941.

1090 537.531 : 535.3

Extra reflections from the 2 types of diamond. LONSDALE, K. *Proc. Roy. Soc. A*, 179, *pp.* 315–320, *Jan.* 23, 1942.—[See Abstr. 1322 (1942)]. All diamonds show primary diffuse reflections, which are temperature-sensitive but not structure-sensitive. These correspond to the diffuse reflections observed under suitable conditions for all other substances. Type I diamonds, only, show the secondary reflections (sharp spots, streaks and groups of spots) which have been previously described [Abstr. 2107, 2108 (1941)], and which are not at all typical of diffuse spots in general. They are not really diffuse, they are not (or only slightly) temperature-sensitive and they are strongly structure-sensitive. Primary and secondary reflections have been observed for many diamonds and in various orientations, associated with the {111} {220} {113} {331} Laue reflections, using filtered and unfiltered radiation from Cu and Fe targets. There is as yet no explanation of the secondary reflections which can account satisfactorily for the structure-sensitiveness, the presence of {220} spots, and the apparent incompleteness of the groups of spots actually observed.

1091 537.531 : 535.3 : 548

Diffuse scattering of X-rays by crystals. The Faxén–Waller theory and the surfaces of isodiffusion for cubic crystals. JAHN, H. A. *Proc. Roy. Soc. A*, 179, *pp.* 320–340, *Jan.* 23, 1942.—An elementary derivation is given of the Faxén–Waller formula for the diffuse scattering of X-rays by thermally excited lattice vibrations and the shapes of the surfaces of isodiffusion in reciprocal space for cubic crystals investigated. It is shown that, for substances with high elastic anisotropy, large deviations from spherical character are to be expected for the surfaces of isodiffusion belonging to each of the individual lattice planes and, moreover, marked differences in shape between surfaces belonging to different lattice planes. The theory is illustrated by calculations made for a simple crystal of Na.

1092 537.531.9 = 3

Changes of pH in water under the influence of X-rays. GÜNTHER, P., AND HOLZAPFEL, L. *Z. phys. Chem. B*, 49, *pp.* 303–308, *Aug.*, 1941.—Concluding their previous research [Abstr. 1697 (1939), 796 (1940)] the authors investigate the influence of the purity of the water on the changes of pH by X-rays. The effect is dependent on the initial pH value and therefore pre-

sumably on the CO_2 content. The temperature dependence of the effect is briefly discussed. R. N.

1093 537.531.9

Effect of temperature and time on the X-ray sensitivity of maize seeds. MAXWELL, L. R., KEMPTON, J. H., AND MOSLEY, V. M. *J. Wash. Acad. Sci.*, 32, *pp.* 18–24, *Jan.* 15, 1942.—Temperatures of dry maize seeds during the time of X-irradiation determine, to a certain extent, the size and number of surviving seedlings. Max. X-ray sensitivity occurs for temperatures 0°C.–25°C.; values extending either above or below this range produce a greater resistance; this includes cooling by liquid air and heating to 66°C.

1094 537.533 = 3

Liberation of single secondary electrons by mesotrons and electrons. STUHLINGER, E. *Z. Phys.*, 116, 5–6, *pp.* 281–297, 1940.—In the Wilson cloud chamber it is observed that among 100 mesotrons about 10 liberate one or several secondary electrons of at least 10 000 eV energy from a sheet of Pb 9 mm. thick. Almost as many electrons are liberated from 9 mm. Al. The multiplication of light electrons of high energy in Pb and Al is considerably stronger; 75% of the electrons, penetrating through a layer of 9 mm., double or multiply their numbers in the layer. The mesotrons are frequently accompanied by photons. For 100 mesotrons within a range of 15 cm., about 40 photons are counted which liberate Compton electrons or electron pairs of at least 10 000 eV energy from a 9 mm. thick sheet of Pb. Investigations with counters on the liberation of secondary particles by mesotrons yielded smaller values throughout, since the counters register only particles able to penetrate through their walls, i.e. particles of at least 1 000 000 eV energy. The measurements with counters indicated that mesotrons liberate less electrons from a sheet of Pb of 1 cm. thickness than from a sheet of Al of equivalent mass. This thickness of Pb corresponds to saturation. The number of secondary particles liberated by mesotrons agrees with the theory of Bhabha if the energy spectrum of the mesotron as measured by Blackett is taken into account. O. O.

1095 537.56 = 3

Townsend's condition for the starting and building-up of a discharge. BARTHOLOMEYCZYK, W. *Z. Phys.*, 116, 3–4, *pp.* 235–245, 1940.—By integration of the equations expressing the balance of the carriers, conditions are derived for the starting and the development of a discharge, taking into account diffusion to the walls and photo-ionization. O. O.

1096 537.561 = 3

The ionization potential of nitrogen molecules. STILLE, U. *Z. Phys.*, 116, 3–4, *pp.* 144–152, 1940.—On the basis of the appearance of negative bands in the afterglow of N_2, the ionization potential of 13·3 V of N_2 molecules, as suggested by Rypdal and Vegard, is discussed. This value cannot be accepted because it leads to contradictions to other well-established data of N_2 molecules. O. O.

1097 537.581

Emissivities and temperature scales of the iron group. WAHLIN, H. B., AND WRIGHT, R. *J. Appl. Phys.*, 13, *pp.* 40–42, *Jan.*, 1942.—The temperature scales have been determined for well-degassed specimens of the iron group and from these the emissivity for $\lambda = 0{\cdot}667\ \mu$ is calculated. Over the range of temperatures covered the emissivity is nearly a const. except at the A_3 point in iron where there is a sudden change.

1098 537.591.15

Penetrating cosmic-ray showers. JÁNOSSY, L. *Proc. Roy. Soc. A*, 179, *pp.* 361–376, *Jan.* 23, 1942.—Observations giving evidence for the existence of showers penetrating at least 50 cm. of Pb are reported. These are parts of extensive air showers. The penetrating showers are neither energetic cascades nor knock-on showers; they are, however, probably connected with the production of mesons. The connection of the penetrating showers observed at sea-level with the production of mesons in the atmosphere is discussed with the following alternative assumptions: (1) that the mesons are produced by photons, (2) that the mesons are mainly produced by protons and possibly neutrons.

MAGNETISM. ELECTROMAGNETISM

1099 538.113

Magnetic susceptibility of 2-dimensional free electron gas. SINGH, B. N. *Indian J. Phys.*, 15, *pp.* 103–111, *April*, 1941.—A theoretical paper. The paramagnetic and diamagnetic susceptibilities of a 2-dimensional free electron gas have been calculated using Fermi–Dirac statistics. The results are compared with the susceptibilities of a 3-dimensional assembly. A. J. M.

1100 538.22 = 3

The effect of pressures within the elastic limit on the maximum susceptibility of nickel. VELAYOS, S. *Z. Phys.*, 116, 5–6, *pp.* 340–348, 1940.—The magnetization curves are determined for small Ni rods after different methods of mechanical and thermal pretreatment for different longitudinal pressures within the elastic limit. The curves representing the susceptibility as a function of the field strength indicate a max. susceptibility increasing with increasing pressure and a shift of this max. to smaller electric fields. The value of this shift depends upon the external pressure and the internal tension of the sample. O. O.

1101 538.22 = 3

Remark on the preceding paper of Salvador Velayos: "The effect of pressures within the elastic limit on the maximum susceptibility of nickel." BITTEL, H. *Z. Phys.*, 116, 5–6, *pp.* 349–351, 1940.—In agreement with the results of other observers, the Ni samples investigated by Velayos show proportionality between the coercive force and the average of the internal tension, provided that no external tension is present. This relation applies even if the various values of the internal tensions are produced by different kinds of mechanical and thermal treatment. It is concluded that the field strength at which the max. susceptibility is observed is proportional to the internal tension. This is confirmed by the measurements of Velayos.

O. O.

1102 538.32 : 621.385.2

Current induced in an external circuit by electrons moving between two plane electrodes. KOMPFNER, R. *Wireless Engr*, 19, *pp.* 52–55, *Feb.*, *erratum*, *p.* 100, *March*, 1942.—[Abstr. 578 B (1942)].

See Abstr. 1103 538.522.3 : 538.565.4 : 621.396.611.1

1103 538.565.4 : 538.522.3 : 621.396.611.1 = 3

The elimination of damping in oscillatory circuits by means of iron-cored inductances. TAEGER, W. *Arch. Elektrotechn.*, 35, *pp.* 193–216, *April* 15, 1941.—[Abstr. 586 B (1942)].

1104 538.566 : 621.396.11 : 621.3.018.1

Investigation of the phase structure of the electromagnetic field and the velocity of radio waves. ALPERT, J. L., MIGULIN, V. V., AND RYASIN, P. A. *J. Phys., U.S.S.R.*, 4, 1–2, *pp.* 13–38, 1941.—[Abstr. 464 B (1942)].

1105 538.613 = 3

The rotation of the plane of polarization in double refracting media. GABLER. F. *Z. Phys.*, 116, 5–6, *pp.* 271–280, 1940.—The equations are discussed describing a double-refracting medium in the magnetic field: (1) if the rotation of the plane of polarization caused by the magnetic field is small, it vanishes as soon as appreciable double refraction occurs; (2) if the magnetic rotation is large, the rotation increases with double refraction and approaches a lim. value for stronger double refraction. Depending upon the amount of the original magnetic rotation, this limit is π, 2π, 3π, etc. The experimental apparatus is described. The magnetic field is produced in a coil with high current, which causes double refraction in a Kerr cell filled with nitrobenzene. The agreement between theory and experiment is good. O. O.

MOLECULAR AND ATOMIC PHYSICS

See Abstr. 966 539.133 : 517.3

1106 539.133 : 537.226.2 = 3

Measurements of dipole moments of gallium chloride and its molecular compounds. ULICH, H., AND HEYNE, G. *Z. phys. Chem. B*, 49, *pp.* 284–292, *July*, 1941.—The dielectric constant was measured of $GaCl_3$ and its compounds with benzonitrile, *p*-nitrotoluene and benzoylchloride, dissolved in benzene, CCl_4 or CS_2. From the measured values—molar fraction, average mol. vol., molar polarizations of solvents and solutes, temperature—the dipole moments were calculated. The behaviour and the constitution of $GaCl_3$ in the different solvents and the constitution of the $GaCl_3$ complex compounds are discussed. R. N.

1107 539.133 : 541.651 = 3

Relations between light absorption and spatial arrangement of molecular aggregates. SCHEIBE, G., MÜLLER, R., AND SCHIFFMANN, R. *Z. phys. Chem. B*, 49, *pp.* 324–333, *Aug.*, 1941.—Two questions relevant to the reversible polymerization of organic dyestuffs [Abstr. 1206 (1938)] are discussed: (1) which forces produce the coherence of single molecules, counteracting the repulsive forces of equal positive charges, (2) which electrons are responsible for the absorption bands due to oscillations perpendicular to the plane of the molecules. The forces are provided by the aromatic rings and the electrons belong to the aromatic and the resonance state, respectively, of the dyestuff. The question of the arrangement of the molecules adsorbed on mica is discussed; a ladder-arrangement is found the more probable. R. N.

1108 539.152.1

Alpha model of nuclear structure and nuclear moments. INGLIS, D. R. *Phys Rev.*, 60, *pp.* 837–851, *Dec.* 15, 1941.—The criticism of the α-model of nuclear structure, based on the contention that the first-order interaction between α-particles is a repulsion, is refuted. The advantages of the model in explaining certain regularities among nuclear moments are emphasized. A. J. M.

See Abstr. 1062 539.152.1 : 535.338

1109 539.152.2

Molecular beams and nuclear moments. HAMILTON, D. R. *Amer. J. Phys.*, 9, *pp.* 319–337, *Dec.*, 1941.—The results obtainable by the study of molecular beams are described, and the technique of the method is considered. Early experiments on nuclear moments are reviewed. Radio-frequency spectroscopy, or the molecular-beam magnetic resonance method, is described in connection with its application to both molecules and atoms. A. J. M.

1110 539.153 = 3

The computation of the eigen-function and energy of the normal state of the valence electrons in alkaline earths. GOMBAS, P. *Z. Phys.*, 116, 3–4, *pp.* 184–193, 1940.—On the basis of the variation method, a method is worked out which permits the computation of the eigen-function and energy of the valence electrons in the normal state of the alkaline earths. The polarization of the core of the atom and the exchange between valence electrons and core electrons are not taken into account. The method is applied to the Ca atom. The computed values of the first and second energy of ionization of Ca are 5·78 and 11·19 eV, in reasonable agreement with the empirical values of 6·09 and 11·82 eV, respectively. The computation is carried through without applying empirical or semi-empirical constants. O. O.

See Abstr. 1063 539.153 : 535.338

1111 539.16.08

Laboratory experiments on radioactive recoil. BROWN, S. C. *Amer. J. Phys.*, 9, *pp.* 373–374, *Dec.*, 1941.—The principle involved is that when a radioactive body decays with the emission of an α-particle or a β-ray, the emitted particle travels in one direction and, to conserve momentum, the resulting nucleus must travel in the opposite direction, and these nuclei are then collected on a plate placed near the source. Full details are given of the apparatus involved and of the experiments made with it. H. H. HO.

1112 539.16.08

Helium-filled Geiger–Müller counters. KAPUR, P. L., SARNA, H. R., AND CHARANJIT. *Curr. Sci.*, 10, *pp.* 521–522, *Dec.*, 1941.

1113 539.16.08 : 535.247

An investigation of the properties and applications of the Geiger–Müller photo-electron counter. DUFFENDACK, O. S., AND MORRIS, W. E. *J. Opt. Soc. Amer.*, 32, *pp.* 8–24, *Jan.*, 1942.—The construction of a reliable photo-electron counter with a Ni cathode and a quartz envelope is described and an account is given of comparative tests on the measurement of the rel. intensities of spectral lines with the counter and by photographic spectrophotometry. The counter has a linear response to variations of intensity of light over a wide range. For measuring the relative intensities of spectral lines the counter tube is mounted on a spectrograph behind a slit which moves on the focal plane of the instrument so that spectral lines are

measured singly. The application of the counter in spectrochemical analysis is demonstrated, and comparative analyses of the same materials by use of the counter and by spectrochemical analysis are given. Studies on the constancy of several spectroscopic sources are described.

1114 539.16.08 : 621.385

The Geiger–Müller tube. WEISZ, P. *Electronics*, 14, *pp.* 18–21, *Dec.*, 1941.—[Abstr. 577 B (1942)].

1115 539.16.08 : 621.385.8

Circuit for self-recording Geiger–Müller counters. JÁNOSSY, L., AND INGLEBY, P. *J. Sci. Instrum.*, 19, *pp.* 30–31, *Feb.*, 1942.—[Abstr. 580 B (1942)].

1116 539.163

Radioactivity of ocean sediments. IV. The radium content of sediments of the Cayman trough. PIGGOT, C. S., AND URRY, W. D. *Amer. J. Sci.*, 240, *pp.* 1–12, *Jan.*, 1942.—[See Abstr. 553 (1941)]. The radio-elements are not in equilibrium in the uppermost layers of the sediments at the bottom of the ocean. Of these elements uranium, ionium and radium, have a sufficiently long $\frac{1}{2}$-life to be of importance. A history of these elements is reflected in the variation of the radium content of ocean sediments with the depth below the ocean floor. Measurements of this variation demonstrate that the concentrations of uranium, ionium and radium, at any given time are established by the usual laws of radioactivity governing the growth and decay of radio-elements in a system that is not in radioactive equilibrium. The experimental results must be adjusted to the conditions that pertained to the undisturbed sediments. This requires a knowledge of the history of the specimens from the time that the sediment was taken by the core-sampler to the time at which the specimens were analysed. The relation between radium content and depth in a given ocean sediment promises a method of determining the rate of accumulation of the deposit at that place.

1117 539.163

The distribution of helium and radioactivity in rocks. II. Mineral separates from the Cape Ann granite. KEEVIL, N. B. *Amer. J. Sci.*, 240, *pp.* 13–21, *Jan.*, 1942.—[See Abstr. 2608 (1940)]. The Essex County granite at Cape Ann, Mass., and its common mineral constituents have been thoroughly studied by the He age method. The granite is more radioactive than usual, probably due to active accessories associated with the femic minerals. The relative radio-activities of the femics, quartz and feldspar, are about 23 : 2 : 1. In spite of the relatively high rate of He production, the femics gave the highest He index, 189. The quartz (94) and feldspar (59) showed evidence of losing He during geological time and after exposure at the surface. Further experiments on minerals are necessary before the He indices can be used in geological correlation.

See Abstr. 1179 539.163 : 551.594.12

1118 539.166.74

Note on the skin-dose measurement of radium moulds: gamma-ray back-scatter. COOK, H. F. *Brit. J. Radiol.*, 15, *pp.* 48–49, *Feb.*, 1942.

1119 539.172.4 = 3

On nuclear isomerism of strontium. REDDEMANN, H. *Z. Phys.*, 116, 3–4, *pp.* 137–143, 1940.—The electron-activity of strontium ($\frac{1}{2}$-life 3 hr.) has been known but not yet ascribed to a definite isotope. After irradiating the pure Sr-isotope 87 with neutrons, the 3 hr. activity could be attributed to a radioactive isomer of the stable Sr 87. The effective cross-section of the transmutation $^{87}Sr(n,n)^{87}Sr^*$ for D + D neutrons is determined. O. O.

1120 539.185.9 : 615

Physical and biological considerations in the use of slow neutrons for cancer therapy. ZAHL, P. A., AND COOPER, F. S. *Radiology*, 37, *pp.* 673–682, *Dec.*, 1941.

1121 539.2 : 541.6 : 532.7 = 3

On molecular states of order and some properties dependent on them in macromolecular substances with fibrous and net structure. I. MÜLLER, F. H. *Kolloid Z.*, 95, *pp.* 137–181, *May*, 1941.—The average state of order of a substance is defined by a distribution function of spatial direction of their monomeric residues which play a part analogous to that of the single molecules in a liquid. Substances containing crystallites or miscelles are excluded, only highly polymerized synthetic or natural substances like polystyrol, caoutchouc in its uncrystallized state, etc., are considered. The change in physical properties with varying orientation, by stretching or the like, is experimentally investigated, e.g. double refraction, tensile strength, shrinkage, X-ray dispersion, thermal properties, especially the force of resilience in highly elastic substances, and reversible and irreversible parts of thermal elongation; the relations between these properties, and their interaction, are discussed. By a suitable mathematical formulation of the distribution functions a quantitative kinetic theory for highly elastic substances is developed [see Abstr. 1131 (1941)], and serves as a complement to Kuhn's theory based on entropy considerations [Abstr. 4461 (1936)].

R. N.

1122 539.211 : 621.357.7

Longitudinal ridged structure in the tin coating of tin-plate. CHALMERS, R., AND HOARE, W. E. *Engineering*, 153, *pp.* 79–80, *Jan.* 23, 1942.—[Abstr. 572 B (1942)].

See Abstr. 1039 539.217.1 : 534.37

1123 539.26 = 3

Non-destructive fine-structure examination of materials by means of X-ray diffraction. BRANDENBERGER, E. *Schweiz. Bauztg*, 118, *pp.* 255–260, *Nov.* 29, 1941. —Discusses the "back-reflection" method and the information regarding structure which can be obtained by its use. The items dealt with include the effects of crystal size, lattice distortion, lattice irregularity and fibre-structure. Examples of the use of the method are given, together with a warning as to its limitations. J. T.

1124 539.31 = 3

New elasticity theory of the processes of deformation and stresses in solid bodies. BRANDENBERGER, H. *Schweiz. Arch. angew. Wiss. Techn.*, 7, *pp.* 223–235, *Aug.*, 1941.—The author premises that the present theory of elasticity does not represent correctly the internal stresses, nor is it possible with the aid of the shear stresses to determine the state of stress, the plastic limit or the direction of flow. New views of the internal stresses are developed in which are intro-

duced a space stress and a lattice stress, and equations are derived by which the behaviour of a body in the plastic state is determined. G. E. A.

1125 539.377 : 535.55

Resilience and double refraction with rolled polystyrol. JENCKEL, E., AND NAGEL, F. *Kolloid Z.*, 97, *pp.* 37–46, *Oct.*, 1941.—Experiments were made on the influence of the rolling temperature and the effect of heat treatment on the double refraction and on the deformation of thin polystyrol films [see Abstr. 4747 (1938)]. While the decrease of double refraction and of contraction as functions of time show a similar trend, an anomaly was found consisting in a period of expansion following the rapid contraction at certain temperatures. This is explained by a model consisting of 3 or more piston-spring arrangements in parallel, as used by Maxwell for describing the behaviour of elasto-viscous substances. Based on this model a tentative explanation is given for the changes in double refraction and contraction as caused by structural changes in the molecular chain, e.g. the turning of phenyl-rings around their links with the polyvinyl chain. [See Abstr. 1121 (1942)]. R. N.

1126 539.382

Analyses of skew slabs. JENSEN, V. P. *Bull. Univ. Ill. Engng Exp. Sta., No.* 332, [110 *pp.*], 1941.—The data contained in the bulletin form part of the results of an investigation of the effect of concentrated loads on reinforced concrete bridge slabs. The behaviour of slabs of various angles of skew and boundary conditions is determined by difference equations. The equations are applied to uniformly loaded slabs supported on 4 edges and on 2 edges. The skew being varied, the analysis of the rectangular slab gives a basis for judging the effect of skew. Influence surfaces are also treated. Particular attention has been directed to the requirements for the analysis of the simple-span slab-bridge with curbs. G. E. A.

1127 539.384 = 3

The breaking load of lattice girders. AMSTUTZ, E. *Schweiz. Bauztg*, 118, *pp.* 97–101, *Aug.* 30, 1941.—A simple formula is worked out on the basis of which the breaking load of any form of lattice girder can be determined. In the plastic region it has to be noted whether the elastic modulus or the breaking modulus is to be employed. For lattice girders of the usual type, for the elastic region, and for other forms of girder, better adapted formulae are given. Their applicability is verified by experiments with small models. G. E. A.

1128 539.384.4

Tests of cylindrical shells. WILSON, W. M., AND OLSON, E. D. *Bull. Univ. Ill. Engng Exp. Sta., No.* 331, [129 *pp.*], 1941.—Report of an investigation to determine the behaviour of thin steel shells subjected to axial compression, transverse shear and flexure, singly or in combinations. The methods of failure studied include (*a*) wrinkling due to longitudinal compression by axial loads, flexure or in combination; (*b*) wrinkling due to diagonal compression induced by shear; (*c*) circumferential compression induced by shear at supports that completely enclosed the shell; (*d*) circumferential moment in supporting-rings that completely enclosed the shell; (*e*) circumferential moment in a shell at pedestals that did not entirely enclose the shell. The experimental results are given in numerous tables, photos and graphs, with a summary and appendix. G. E. A.

1129 539.4 = 3

Ni- and Mo-free constructional steels. KIESSLER, H. *VDI* [*Z. Ver. dtsch. Ing.*], 84, *pp.* 385–392, *June* 8, 1940.—For some alloyed steels with no Ni or Mo content the properties with regard to strength, deformation and notch test, and their heat treatment, are described and illustrated in graphs. Proposals are made for the use of various strengthened steels. The dependence of the strength properties on the dimensions of the test pieces is discussed and tables are given for facilitating the choice between various materials for special purposes. R. N.

1130 539.4 = 3

Strength and permissible load of synthetic material: polyvinylchloride. BACHMANN, W. *VDI* [*Z. Ver. dtsch. Ing.*], 84, *pp.* 425–431, *June* 22, 1940.—The deformation mechanism of polymerized synthetic materials, e.g. polyvinylchloride, is similar to that of low-molecular anorganic glasses; in either case a local molecular exchange occurs with continued strain and with increase of temperature. The results of fatigue tests with unidirectional stresses on bars and tubes of polyvinylchloride are given. Graphs show the strength and elongation as functions of time and of temperature. The results of impact tests and notching impact tests, and the strength after 1 700 hr. loading are given. R. N.

1131 539.4.016.3

Elastic properties of some alloy cast irons. KRYNITSKY, A. I., AND SAEGER, JR., C. M. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 73–94, *Jan.*, 1942.—Transverse-strength properties were determined on 1·2 in. dia. test bars made from 3 types of alloy iron heated, before casting, to the max. temperatures of 1 400°, 1 500°, 1 600°, and 1 700°C. The bars were vertically cast, bottom-poured in green-sand moulds, at a temperature of 100, 150, 200, or 250 deg. C. above the liquids. Total, plastic and elastic deflection, modulus of rupture, relative moduli of elasticity, and total, plastic and elastic resilience were determined, and the microstructure of the test bars was examined. Comparative values of 4 different relative moduli of elasticity relating to the same test bars but calculated by different methods are discussed. Comparison of transverse test properties of alloy and plain carbon irons is made.

1132 539.5 : 621.791

The tee-bend test to compare the welding quality of steels. ELLINGER, G. A., BISSELL, A. G., AND WILLIAMS, M. L. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 1–49, *Jan.*, 1942. [Abstr. 601 B (1942)].

1133 539.531 : 621.317.41 = 3

Magnetic testing of hardness of high-speed steels. SPRINGER, H. *VDI* [*Z. Ver. dtsch. Ing.*], 84, *pp.* 365–370, *June* 1, 1940.—[Abstr. 551 B (1942)].

1134 539.62

Mechanism of kinetic friction. BRISTOW, J. R. *Nature, Lond.*, 149, *pp.* 169–170, *Feb.* 7, 1942.

PHYSICAL CHEMISTRY

1135 541.115 : 535.24 = 3

Photometric determination of the free formation enthalpy of aqueous nitrosylchloride. SCHMID, H.,

AND MASCHKA, A. *Z. phys. Chem. B*, 49, *pp.* 171–186, *July*, 1941.—The thermodynamic equilibrium const. of the reaction $NOCl + H_2O = HNO_2 + HCl$ at 25°C. was determined by a photometric method. The specific extinction was measured with varying conc. of HCl and for HNO_2 conc. rising by steps of 5 mmols HNO_2/l. S-shaped curves are obtained, equidistant at their horizontal trend and therefore applicable for calibration purposes, while the range of the curves for conc. between 4 and 7 HCl/l. is approx. linear and serves for determining the equilibrium const. This was found to be $(0{\cdot}88 \pm 0{\cdot}04) \times 10^3$. The free formation enthalpy of aqueous NOCl was calculated to be + 16 015 cal. at 25° C.

R. N.

See Abstr. 1010 541.123.4 : 531.19

1136 541.124

The effects of heat on dry proteins. I. BERNHART, F. W. *J. Phys. Chem.*, 45, *pp.* 1382–1387, *Dec.*, 1941.—A description is given of the kinetics of the reaction resulting in the formation of insoluble egg albumin when dry egg albumin is heated; the activation energy for this reaction is calculated to be 33 k.cal./mole. H. H. HO.

See Abstr. 1083 541.127 : 537.226.2

1137 541.135.5

Application of the dropping-mercury electrode to the investigation of the polyhydroxy acids and lactones. MATHESON, H., ISBELL, H. S., AND SMITH, E. R. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 95–131, *Jan.*, 1942.—The polarographic method is used for a study of the polyhydroxymonocarboxylic acids, their lactones, lactides and other condensation products. With a tetraethylammonium chloride environment, polarographic waves are obtained which show the behaviour of the hydroxy acids and their lactones with respect to electrolytic reduction and the products which they form in dilute acids. Full details of apparatus and procedure are included. When a solution containing an aldonic acid is allowed to stand, the wave due to the hydrogen ion decreases and a wave caused by the γ-lactone appears. In the presence of oxygen a wave, apparently caused by some substance produced by the interaction of the sugar acid, mercury and oxygen, forms at about $-1{\cdot}1$ V. The formation of this wave is accompanied by a corresponding decrease in the hydrogen wave. The stereometric positions of the hydroxyl groups are of importance. H. H. HO.

See Abstr. 1141 541.14 : 532.71 : 541.18

1138 541.144.7

Photosynthesis in flashing light. WELLER, S., AND FRANCK, J. *J. Phys. Chem.*, 45, *pp.* 1359–1373, *Dec.*, 1941.—Photosynthesis in *Chlorella pyrenoidosa* has been investigated by means of light flashes. At 20°C. and in the absence of inhibitors the half-time for the limiting dark period is about 0·01 sec.; the dark reaction is identified with the recovery period of catalyst *B* of Frank and Herzfeld's scheme. KCN not only prolongs the duration of the dark period, but also changes the shape of the yield per flash curve; this indicates a poisoning of catalyst *B* (responsible for saturation) and catalyst *A* (involved in the dark fixation of CO_2. Low temperatures prolong the dark period, and the shape of the yield curves indicates that both *A* and *B* contribute to the saturation phenomena. Hydroxylamine reduces the rates of photosynthesis in flashing and continuous light by the same percentage. H_2O_2 (in presence of cyanide which is later removed) inhibits photosynthesis irreversibly. The apparent long dark period found in equal light- and dark-time experiments depends on internal conditions and appears to be related to McAlister's "pick-up phenomenon" of CO_2.

H. H. HO.

1139 541.144.7

Quantum efficiency of photosynthesis. BALY, E. C. C. *Nature, Lond.*, 149, *pp.* 218–219, *Feb.* 21, 1942.

1140 541.18 : 532.1 : 621.315.611 : 621.3.015.51 = 3

On temperature dependence of the breakdown of solid insulating materials. BÖNING, P. *Kolloid Z.*, 95, *pp.* 181–185, *May*, 1941.—[Abstr. 527 B (1942)].

1141 541.18 : 532.71 : 541.14

The action of light on cellulose. VI. MONTONNA, R. E., AND JILK, L. T. *J. Phys. Chem.*, 45, *pp.* 1374–1381, *Dec.*, 1941.—This paper contains a method for the measurement of the osmotic pressure of colloidal solutions, based on the determination of the effect of ultra-violet irradiation on the mol. wt. of cellulose nitrate in acetone solution as found from the osmotic pressures of the solutions after various intervals of exposure. Very full discussions and descriptions with illustrations are given of the osmotic cell, the preparation of membranes, and the actual osmotic-pressure measurements. H. H. HO.

1142 541.18 : 535.34 = 3

Investigations on serum proteins with special regard to the blood groups. GROH, J. *Kolloid Z.*, 94, *pp.* 1–10, *Jan.*, 1941.—Physical and chemical differences between chemically related albuminous substances of biologically different behaviour are established. The light absorption of proteins in the ultra-violet range were particularly investigated and the effect on absorption of treatment with alkali which produces a partial hydrolysis of the proteins. The difference between max. and min. values of the extinction coeff. is small for the blood group A and large for the B group, while the rise of the extinction coeff. due to alkali is negligible for the B group and considerable for the A group. For the O group a different behaviour was observed for male and female blood. The alkali effect is attributed to enolic change which produces chromophorous groups. R. N.

1143 541.18 : 535.5 = 3

Longitudinal depolarization of light in suspensions of crystalline particles and colloidal suspensions. PROCOPIU, S. *Kolloid Z.*, 97, *pp.* 1–27, *Oct.*, 1941.—A comprehensive review of work done by the author, his collaborators and other investigators since the effect was discovered [Abstr. 525 (1922)]. The conditions influencing the angle of depolarization are discussed and methods of calculation are given. Certain anisotropic colloids depolarize the beams of light when in the state of gels. The part played by longitudinal depolarizaton for the lateral dipersion of light in connection with the Tyndall effect is described. An explanation is given for the depolarization and practical applications of the effect are discussed concerning crystalline deposits, time required for floccula-

tion, live and dead cells, starch suspensions at varying temperatures, cellulose suspensions under the effect of chemical reagents, and of liquid crystals. R. N.

1144 541.18 : 535.822.4 = 3

Auxiliary apparatus for counting particles in the slit-ultramicroscope. SPENGLER, O., AND HIRSCHMÜLLER, H. *Kolloid Z.*, 94, *pp.* 29–30, *Jan.*, 1941.—Instead of the overloaded Hg lamp recommended as a light source [Abstr. 2216 (1938)] a 40 A Beck arc lamp was used, operated with 100–120 A. Cinematographic pictures were taken of highly colloidal sugar solutions, and the particles were counted with a metronome arranged as a current interruptor and 3 separate counters controlled by hand-operated switches. One counter records the total number of interruptions, the other 2 the appearance of 1 or 2 particles, respectively, in the meshes of the counting net. R. N.

See Abstr. 1074 541.18 : 537.226.2 : 532.782 : 536.421

1145 541.18.041

The second phase of rennet coagulation. BERRIDGE, N. J. *Nature, Lond.*, 149, *pp.* 194–195, *Feb.* 14, 1942.

See Abstr. 1152 541.18.045.2 : 532.71 : 541.8

1146 541.182 : 532.72 = 3

On determinations of poly-dispersiveness from diffusion measurements by Lamm's scale method. GRALÉN, N. *Kolloid Z.*, 95, *pp.* 188–194, *May*, 1941.—Formulae are given and discussed, for calculating diffusion const. from curves obtained by Lamm's refractometric method. Different average values are obtained for poly-disperse and pauci-disperse systems, according to the method of calculation. A measure for poly-dispersiveness is defined and, as an example, the calculations are given for gluten albumin. Assuming a logarithmic distribution of the molecular sizes, the average values of the diffusion const. and poly-dispersiveness are calculated and a coeff. of non-uniformity is defined. The method is especially suitable for dispersed media consisting of long molecular chains. R. N.

1147 541.183.1 = 3

Mixed adsorption of amylene and ethylene on active carbon. MAGNUS, A., AND SPALT, A. *Z. phys. Chem. B*, 49, *pp.* 187–195, *July*, 1941.—The single adsorptions of amylene at 100°C. and of ethylene at 0° and 100°C. on active carbon and the mixed adsorption of both vapours at 100°C. are investigated. A modified Langmuir formula is derived, possessing a quadratic correction term of pressure. For higher pressure ranges, calculated and experimental values of adsorption are in good agreement for ethylene at 100°C. and for mixed adsorption. Ethylene at 0°C. and amylene show a different behaviour which is attributed to capillary condensation. With mixed adsorption amylene appears to block the most active spots of the carbon without being disturbed by the presence of ethylene. R. N.

See Abstr. 1081 541.183.2 : 536.717

1148 541.183.26

A note on the similarity of the adsorbed state of gases to that under high pressure. SEN, S. *Sci. and Cult.*, 7, *pp.* 317–319, *Dec.*, 1941.

1149 541.24 = 3

Molecular weight of gaseous sulphur. KLEMM, W., AND KILIAN, H. *Z. phys. Chem. B*, 49, *pp.* 279–283, *July*, 1941.—The density of gaseous S was determined for temperatures between 450° and 850°C. and for pressures between 100 and 800 mm. Hg. The results are considered as preliminary, but they tend to show that values found by previous investigators [Abstr. 1045 (1910)] need checking. R. N.

1150 541.57

Hydrogen bonds involving the sulphur atom. HEAFIELD, T. G., HOPKINS, G., AND HUNTER, L. *Nature, Lond.*, 149, *p.* 218, *Feb.* 21, 1942.

See Abstr. 1121 541.6 : 532.7 : 539.2

See Abstr. 1107 541.651 : 539.133

1151 541.8 : 532.71 = 3

Change of concentration of electrolyte solutions when filtered through collodion diaphragms. HACKER, W. *Kolloid Z.*, 94, *pp.* 11–29, *Jan.*, 1941.—The electrolytes HCl, LiCl, NaCl, KCl, RbCl, NH_4Cl, $MgCl_2$ and $BaCl_2$ in diluted aqueous solutions were investigated in an ultra-filter fitted with a collodion diaphragm and with a stirrer arranged above the diaphragm. The strainer effect of the diaphragm was measured as a function of the speed of the stirrer. A marked increase of this effect with decreasing conc. was found for various HCl solutions. No strainer effect was measurable with solutions of LiCl, $BaCl_2$ and $MgCl_2$, while the other solutions showed an increase of the effect with rising intensity of stirring. The concentrations were determined by measuring the electric conductivity. Empirically and by theoretical considerations the equation $\kappa = KV^{-a}$ was established, where κ = spec. conductivity, V = vol. of solution above the filter; a and K are const. dependent on the intensity of stirring and on conc. R. N.

1152 541.8 : 532.71 : 541.18.045.2 = 3

The composition of ultrafiltrates of electrolyte solutions and sols under the action of the strainer effect of collodion diaphragms. HACKER, W. *Kolloid Z.*, 95, *pp.* 194–206, *May*, 1941.—In pursuance of previous investigations [Abstr. 1151 (1942)] the author derives relations for calculating the sp. conductivity of the single filtrates obtained in filtering dilute electrolyte solutions through collodion diaphragms. Two extreme cases are considered: (1) no mixture taking place between the new filtrate and that remaining at the filter plate from a preceding test, (2) complete mixture occurs immediately. The results of the calculations deviate by less than 1% from the test results obtained with HCl and NaCl solutions. The strainer effect of the diaphragm in the ultrafiltration of sols is investigated. As an example, a Fe_2O_3 sol is dealt with. The change of the sp. conductivity is due partly to the strainer effect and partly to the effect of Donnan's membrane equilibrium [Abstr. 101 (1912)]. The calculation of sp. conductivity of the micellar part of the sol is briefly discussed. R. N.

See Abstr. 1080 541.8 : 536.7

PRACTICAL CHEMISTRY

See Abstr. 1029 542.63 : 532.77

1153 542.76

Analyser for 1 ml. of respiratory gas. SCHOLANDER, P. F. *Rev. Sci. Instrum.*, 13, *pp.* 27–31, *Jan.*, 1942.

1154 542.76

Volumetric microrespirometers. SCHOLANDER, P. F. *Rev. Sci. Instrum.*, 13, *pp.* 32–33, *Jan.*, 1942.

CRYSTALLOGRAPHY

1155 548 : 531.7 = 3

On the high-temperature modification of cellulose (cellulose IV). HESS, K., AND KIESSIG, H. *Z. phys. Chem. B*, 49, *pp.* 235–244, *July*, 1941.—The lattice dimensions are determined of cellulose which after milling is heated to 200°C. in water or glycerine. The lattice is the same as that of the modification described by Kubo [Abstr. 2211 (1941)] which was obtained by treating mercerized cellulose fibres in water or glycerine at 250°C. The lattice dimensions are compared with those of other modifications, viz. natural cellulose, hydrated cellulose and a modification obtained by disintegrating ammonia cellulose. The differences in the X-ray diagrams and the transformation mechanics of the modifications are discussed. Contrary to the assumption of previous investigators, it is shown that cellulose IV does not exist in nature. R. N.

1156 548 : 535.39

Conical refraction in naphthalene crystals. RAMAN, C. V., RAJAGOPALAN, V. S., AND NEDUNGADI, T. M. K. *Proc. Indian Acad. Sci. A*, 14, *pp.* 221–227, *Sept.*, 1941.—The preparation of large single crystals of naphthalene and their cutting and mounting for the study of their conical refraction is described. Naphthalene has very large conical angles (13° 44′ and 13° 51′), and exceptionally clear photographs showing the external and internal conical refraction were obtained. Other photographs show the appearance when the viewing microscope is directed to a point source, in or out of focus, with the crystal plate intervening. These appearances are explained. W. S. S.

1157 548 : 535.4 = 3

The grating constant of calcite determined by the turning-crystal method. IEVINS, A., AND STRAUMANIS, M. *Z. Phys.*, 116, 3–4, *pp.* 194–206, 1940.—The grating const. of calcite crystals of various degrees of purity are determined at an accurately defined temperature by the turning-crystal method, applying the non-symmetrical procedure. Eight crystals, all found at different places, showed differences up to 0·00123 Å. The const. is lower the less pure the crystal. The presence of $MnCO_3$ and $MgCO_3$ reduces the grating const., $SrCO_3$ increases it. The 6 crystals found in Iceland and Egremont had the largest const.—$d_{100} = 3{\cdot}02900$, differing from Siegbahn's value by 0·00045 Å (18°C.). The rhombohedric angle $\alpha = 101° 54' 5''$ agrees with the value of Bearden. It is not correct to apply the grating const. 5·628 for rock-salt, 5·62779 Å is preferable. O. O.

GEOPHYSICS

1158 550.384

Greenwich frequency-statistics of geomagnetic disturbance. CHAPMAN, S. *Terr. Magn. Atmos. Elect.*, 46, *pp.* 385–400, *Dec.*, 1941.—The sum of the hour-to-hour changes (regardless of sign) of H at Greenwich, from one Greenwich noon to the next, is denoted by v_H; it has been determined for 21 323 days, covering the period 1848–1913, less 1864–67. On quiet days v_H is governed by the quiet-day solar daily variation, S_q; on disturbed days the disturbance-field D makes the main contribution to v_H. Frequency tables are given, showing the proportion of days on which v_H lies within assigned ranges, (i) for the mean of the year, (ii) for the mean of each calendar month, and (iii)—for each of 3 seasons—for 5 groups of years of different mean sunspot number, and (iv) for 2 groups of years of similar mean sunspot number, but taken from the ascending and descending parts of the sunspot cycle. Similar frequency tables, for the same years (plus 1914), and for the same subdivisions of the material, have previously been given, for 20 762 Greenwich lunar days, for R_{DD}, the daily range of the variation of the Greenwich magnetic declination, D, after the monthly mean solar daily variation S has been removed; R_{DD} thus depends on the D-field, except that, when this field is weak, R_{DD} will partly measure the day-to-day variation of the S_q-field. The frequency distributions for v_H and R_{DD}, especially as regards their dependence on the season and the sunspot epoch, are similar. A method of correcting the v_H-statistics for the influence of S_q is devised and applied to the annual mean frequency curve; the R_{DD}-statistics are more tentatively corrected for the influence of the S_q day-to-day variability on quiet days; the corrected frequency curves for H and D are in notably good agreement. The numerical measure v_H which, except on quiet days, is largely determined by the D-field, is shown to be rather closely correlated with the international daily magnetic character-figure C for nearly all the months of a sample year (1901).

1159 550.384 : 551.524.33

Comparison of long periodic variations in magnetic elements and air-temperature. WASSERFALL, K. F. *Terr. Magn. Atmos. Elect.*, 46, *pp.* 417–430, *Dec.*, 1941.

1160 550.385

Some relationships in the fields of geomagnetic storms. CYNK, B. *Terr. Magn. Atmos. Elect.*, 46, *pp.* 431–433, *Dec.*, 1941.

1161 550.385

Principal magnetic storms. *Terr. Magn. Atmos. Elect.*, 46, *pp.* 473–480, *Dec.*, 1941.

1162 550.385 : 523.74

The sunspot group associated with the magnetic storm of Sept. 18, 1941. RICHARDSON, R. S. *Terr. Magn. Atmos. Elect.*, 46, *pp.* 459–460, *Dec.*, 1941.

1163 550.385 : 551.594.5

The aurora and geomagnetic storm of September 18–19, 1941. MCNISH, A. G. *Terr. Magn. Atmos. Elect.*, 46, *pp.* 461–463, *Dec.*, 1941.

1164 550.389

Investigation of height of local magnetic anomaly at Port Snettisham, South-Eastern Alaska. GEBHARDT, R. E. *Terr. Magn. Atmos. Elect.*, 46, *pp.* 451–454, *Dec.*, 1941.—The geological structure of the area is described. Observations were made of the declination during aircraft flights over the area at heights 100, 500, 1 000, 2 000 and 3 000 ft., and the results are shown in curves. An appreciable effect

was found over about 20 sq. miles of land and water, but vertically it does not extend above 3 000 ft.

R. S. R.

1165 550.389.13

American *URSI* broadcasts of cosmic data, giving American magnetic character-figure, C_A, three-hour-range indices, K, and mean K-indices, K_A, for July to Sept., 1941. JOHNSTON, H. F. *Terr. Magn. Atmos. Elect.*, 46, *pp.* 465–468, *Dec.*, 1941.

1166 550.389.13

Solar and magnetic data, July to September, 1941, Mount Wilson Observatory. NICHOLSON, S. B., AND MULDERS, E. S. *Terr. Magn. Atmos. Elect.*, 46, *pp.* 471–472, *Dec.*, 1941.

PHYSICAL GEOGRAPHY

1167 551.417

Mean sea-level and sand movements. LEYPOLDT, H. *Science*, 94, *pp.* 607–609, *Dec.* 26, 1941.

1168 551.510.535

Ionospheric characteristics at Huancayo, Peru, for the year 1940. COILE, R. C. *Terr. Magn. Atmos. Elect.*, 46, *pp.* 435–442, *Dec.*, 1941.

1169 551.510.535

The ionosphere at Huancayo, Peru, July to September, 1941. LEDIG, P. G., COILE, R. C., AND JONES, M. W. *Terr. Magn. Atmos. Elect.*, 46, *pp.* 443–446, *Dec.*, 1941.

1170 551.510.535

The ionosphere at Watheroo, Western Australia, July to September, 1941. PARKINSON, W. C. *Terr. Magn. Atmos. Elect.*, 46, *pp.* 447–450, *Dec.*, 1941.

1171 551.510.535

Critical frequencies and virtual heights of the ionosphere, observed by the Nat. Bur. of Stds, at Washington, D.C., July to September, 1941. *Terr. Magn. Atmos. Elect.*, 46, *pp.* 468–470, *Dec.*, 1941.

1172 551.515.2

Tropical disturbances of September, 1941. SUMNER, H. C. *Mon. Weath. Rev., Wash.*, 69, *pp.* 264–266, *Sept.*, 1941.

1173 551.515.2

Hurricane of October 3–12 and tropical disturbance of October 18–21, 1941. SUMNER, H. C. *Mon. Weath. Rev., Wash.*, 69, *pp.* 303–304, *Oct.*, 1941.

1174 551.521.1

Solar radiation and sunspot data for September, 1941. NEEDRE, S. *Mon. Weath. Rev., Wash.*, 69, *pp.* 286–291, *Sept.*, 1941.

1175 551.521.1

Solar radiation and sunspot data for October, 1941. CULLINANE, H. *Mon. Weath. Rev., Wash.*, 69, *pp.* 323–327, *Oct.*, 1941.

See Abstr. 970 551.521.3 : 517.65

See Abstr. 1159 551.524.33 : 550.384

1176 551.582

Meteorological and climatological data for Sept., 1941. *Mon. Weath. Rev., Wash.*, 69, *pp.* 266–286, *Sept.*, 1941.

1177 551.582

Meteorological and climatological data for Oct., 1941. *Mon. Weath. Rev., Wash.*, 69, *pp.* 304–322, *Oct.*, 1941.

1178 551.593.64

Circumzenithal arc tangential to a corona of 46°. MATHUR, S. B. L. *Indian J. Phys.*, 15, *pp.* 123–129, *April*, 1941.—Observations of 3 coloured arcs seen from Lucknow in the afternoon of Sept. 9, 1939, are described. Although no accurate measurements could be taken at the time, the author, from considerations of the intensity of the hues and their sequence, concludes that he saw a circumzenithal arc tangential to a corona of 46°, and a section of another corona of 22°. The sequence of the hues is in favour of the two arcs being coronae and not the well-known halos of these radii. A. HU.

1179 551.594.12 : 539.163

Radioactivity of rocks and ionization balance of the atmosphere. HESS, V. F. *Terr. Magn. Atmos. Elect.*, 46, *pp.* 409–415, *Dec.*, 1941.—The ionization produced by γ-rays from radioactive substances in rocks and soil, calculated from figures given recently as average values for representative classes, turns out considerably smaller than actually observed. Two methods are developed theoretically which make it possible to determine simultaneously the residual ionization, the effect of cosmic rays and of the γ-rays from radioactive substances in the Earth, and to separate these components of the total ionization.

1180 551.594.13

Comparison of methods for computing air-earth current. SHERMAN, K. L. *Terr. Magn. Atmos. Elect.*, 46, *pp.* 401–407, *Dec.*, 1941.—Average hourly values of air-earth current determined by the indirect method at College, Alaska, for 11 months in 1932–33 are tabulated. It is shown that, because of the usual negative correlation between gradient and conductivity, the values of current derived from these elements, if averaged over periods greater than 1 hr., will generally exceed those derived from values averaged over hourly intervals. The magnitude and variation of this excess at College are given in detail for the case where the longer period is 1 hr. from all the days selected in each month. The max. excess in an hourly mean value is 29%. The effect upon the amplitude of the diurnal variation would be approx. 25% of the true variation in current. The excess computed from values of gradient and conductivity averaged over other periods of time and for some other places is also given and discussed. The max. excess in the daily mean values at College would be approx. 50% whereas at other stations it may often be greater than this. These considerations suggest that, because of the difficulty of computing exact values, the indirect method of measurement may be expected to yield greater values of air-earth current than the direct method.

See Abstr. 1163 551.594.5 : 550.385

1181 551.594.5 : 621.396.812.5

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